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Vol. 5, No. 7

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 36517 - 37614.

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AIR POLLUTION ABSTRACTS

36517 - 37614

JULY 1974

U.S. ENVIRONMENTAL PROTECTION AGENCY
Assistant Administrator for Air and Water Programs
Office of Air Quality Planning and Standards
Control Programs Development Division
Research Triangle Park, N. C. 27711

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AIR POLLUTION ABSTRACTS

VOLUME 5, NO. 7 JULY 1974

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

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Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

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Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

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Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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CRT DISPLAY SOFTWARE FOR EPA NATIONAL EMISSIONS DATA SYSTEM (NEDS) AND THE STORAGE AND RETRIEVAL OF AEROMETRIC DATA (SAROAD).
Systems Science, Inc., P. O. Box 2345, Chapel Hill, North Carolina 27514

Contract No. 68-02-0663, Modification No. 4 .... *$224,420*
ANALYSIS OF AUTOPSY TISSUE SPECIMENS FOR TRACE METAL CONTENT.
Stewart Laboratories, Inc., 820 Tulip Avenue, Knoxville, Tennessee 37921

Contract No. 68-02-1462, RFP No. Du-74-X018 .... *$25,601*
DETERMINATION OF THE FEASIBILITY OF THE LONG-RANGE TRANSPORT OF OZONE OR OZONE PRECURSORS.
Meteorology Research, Inc., 464 West Woodbury Road, Altadena, California 91001

Contract No. 68-02-1701, RFP No. Du-74-B486 .... *$54,000*
COMPARE RELATIVE TOXICITIES OF AUTOMOTIVE METALLIC EMISSIONS AGAINST LEAD COMPOUNDS USING BIOCHEMICAL PARAMETERS.
University of North Carolina, Office of Contract Administration, 440 W. Franklin Street, Chapel Hill, North Carolina 27514

Contract No. 68-02-1385, Task Order No. 9 .... *$60,000*
TECHNICAL SUPPORT FOR THE DEVELOPMENT OF PLANS AND PROCEDURES FOR THE REGULATION OF PARKING IN NEW JERSEY.
TRW, Inc., Transportation & Environmental Operations, 7600 Colshire Boulevard, McLean, Virginia 22101

Contract No. 68-02-1385, Task Order No. 10 .... *$50,000*
DETERMINATION OF NEED AND DEVELOPMENT OF PHOTOCHEMICAL OXIDANT/HYDROCARBON CONTROL STRATEGY FOR LOUISIANA PORTION OF SOUTHERN LOUISIANA SOUTHEAST TEXAS AQCR 106.
TRW, Inc., Transportation & Environmental Operations, 7600 Colshire Drive, McLean, Virginia 22101

Contract No. 68-02-1438, RFP No. Du-74-A090 .... *$188,834*
FRACTIONAL EFFICIENCY OF A UTILITY BOILER BAGHOUSE.
GCA Corporation, Technology Division, Burlington Road, Bedford, Massachusetts 01730
(NOTE: Contract contains options in the amount of $41,170)

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ASSISTANCE TO REGION IV STATES IN POSSIBLE RECLASSIFICATION AND TRANSPORTATION STUDIES AND NEDS WORK.

PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1291, RFP No. Du-74-B488 .... *$71,625*

DEVELOPMENT OF A PORTABLE LIDAR PLUME OPACITY INSTRUMENT.

Stanford Research Institute, Menlo Park, California 94025 (NOTE: Contract contains options in the amount of $71,959)

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EVALUATION OF OREGON & WASHINGTON TRANSPORTATION CONTROL PLANS AS THEY RELATE TO VMT REDUCTION MEASURES' IMPACT ON AIR QUALITY, IMPACT OF REDUCING GEOGRAPHICAL COVERAGE OF SOME MEASURES, AND EFFECTIVENESS OF ALTERNATIVE MEASURES.

GCA Corporation, GCA Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1213, Modification No. 2 .... *$68,054*

STUDY OF FOLLOW-UP OF PATIENTS RECEIVING DIAGNOSTIC DOSES OF RADIOACTIVE IODINE DURING CHILDHOOD.

Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

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J. Lee Hackett Company, 23550 Haggerty Road, Farmington, Michigan 48024

Contract No. 68-02-1439, RFP No. Du-74-A039 .... *$118,500*

STUDY OF CONCEPTS FOR MINIMIZING EMISSIONS FROM COKE-OVEN DOOR SEALS.

Battelle Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-1638, RFP No. Du-74-C798 .... *$50,250*

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Pel-Freez Bio-Animals, Inc., P. O. Box 68, Rogers, Arkansas 72756

Contract No. 68-02-1717, RFP No. Du-74-B533 .... *$70,000*

EVALUATE THE EFFECT OF CHRONIC OR INTERMITTENT EXPOSURE TO RESPIRABLE PARTICLES AND MISTS USING THE MOUSE PULMONARY INFECTIVITY MODEL.

IIT Research Institute, 10 West 35 Street, Chicago, Illinois 60616

Contract No. 68-02-1716, RFP No. Du-74-B477 .... *$50,702*

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Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-0626, Modification No. 6 .... *$98,384*

EVALUATION AND COLLABORATIVE TESTING OF METHODS RECOMMENDED FOR MEASUREMENT OF STATIONARY AND MOBILE SOURCE EMISSIONS.

Southwest Research Institute, 8500 Culebra Road, P. O. Drawer 28510, San Antonio, Texas 78284

Contract No. 68-02-1279, RFP No. Du-74-B350 .... *$107,500*

CHARACTERIZE PARTICULATE EMISSIONS - PROTOTYPE CATALYST CARS.

Esso Research and Engineering Company, P. O. Box 51, Linden, New Jersey 07036 (NOTE: Contract contains options in the amount of $107,500)

Contract No. 68-02-1704, RFP No. Du-74-B493 .... *$44,489*

APPLICATION OF REPRO-MODELING CONCEPTS TO EMPIRICAL FORMULATIONS OF METEOROLOGICAL MODELS.

Technology Service Corporation, 225 Santa Monica Boulevard, Santa Monica, California 90401

Contract No. 68-02-1380, Task Order No. 6 .... *$35,000*

EVALUATION OF COMPLIANCE STATUS OF NEW JERSEY SOURCES.

Engineering Science, Inc., 7903 Westpark Drive, McLean, Virginia 22101

Contract No. 68-02-1375, Task Order No. 7 .... *$30,000*

SMELTER AMBIENT MONITORING PROJECT IN THE STATE OF ARIZONA.

PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1385, Task Order No. 7 .... *$30,000*

ENERGY CONSERVATION/ALLOCATION IMPACTS ON LIGHT DUTY VEHICLE MILES TRAVELED STUDIES.

TRW, Inc., One Space Park, Redondo Beach, California 90278

Contract No. 68-02-1702, RFP No. Du-74-B510 .... *$31,884*

SCREENING, RECRUITMENT AND PROVISION OF HUMAN EXPERIMENTAL SUBJECTS FOR PHYSIOLOGICAL AND BEHAVIORAL STUDIES.

University of North Carolina, Office of Contract Administration, 440 West Franklin Street, Chapel Hill, North Carolina 27514

Contract No. 68-02-1413, RFP No. Du-73-A166 .... *$125,000*

DEMONSTRATION/EVALUATION OF THE TELLER BAGHOUSE SYSTEM.

Rochester Smelting and Refining Company, Inc., 26 Sherer Street, Rochester, New York 14611

Contract No. 68-02-1443, RFP No. Du-74-A202 .... *$52,538*

FEASIBILITY STUDY AND DEVELOPMENT OF PROTOTYPE ULTRA-SENSITIVE MASS SPECTROMETER FOR DETECTION OF ELECTROPHILIC MATERIALS.

AeroChem Research Laboratories, P. O. Box 12, Princeton, New Jersey 08540

Contract No. 68-02-1648, RFP No. Du-74-C741 .... *$6,266*

COURIER SERVICES.

Eastern Courier, 4030 Vesta Drive, Raleigh, North Carolina 27603 (NOTE: Contract contains options in the amount of $29,800)

Contract No. 68-02-1232, Modification No. 1 .... *$50,000*

MEASUREMENT OF LIGHT HYDROCARBONS IN THE FIELD AND STUDIES OF TRANSPORT OF OXIDANT BEYOND URBAN AREAS.

Washington State University, Engineering Research Division, Pullman, Washington 99163

Contract No. 68-02-1622, RFP No. Du-74-C751 .... *$79,676*

LIBRARY SERVICES IN CONNECTION WITH EPA LIBRARY AT THE NATIONAL ENVIRONMENTAL RESEARCH CENTER.

The University of North Carolina, P. O. Box 2688, Chapel Hill, North Carolina 27514

Contract No. 68-02-1293, RFP No. Du-74-B492 .... *$49,850*
PLUME DISPERSION IN STABLY STRATIFIED FLOW OVER COMPLEX TERRAIN.
Flow Research, Inc., 1819 South Central Avenue, Kent, Washington 98031

Contract No. 68-02-1376, Task Order No. 5 .... *$50,000*
ANALYZE TIME-CONCENTRATION RELATIONSHIPS AND VALIDATE DISPERSION MODEL.
GCA Corporation, GCA Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1294, RFP No. Du-74-B494 .... *$50,000*
TOWING TANK EXPERIMENTS TO OPTIMIZE SITING OF SO2 MONITORS NEAR ASARCO LEAD SMELTER IN MISSOURI.
Flow Research Inc., 1819 S. Central Avenue, Kent, Washington 98031

Contract No. 68-02-1380, Task Order No. 5 .... *$60,000*
PREPARATION OF COMPLIANCE INFORMATION FOR THE CDS SYSTEM AND REVIEW OF 114 RESPONSES.
Engineering Science, Inc., 7903 Westpark Drive, McLean, Virginia 22101

Contract No. 68-02-1297, RFP No. Du-74-B438 .... *$49,997*
SPECTRAL MODELING OF TURBULENT DIFFUSION IN A STRATIFIED FLUID.
Flow Research, Inc., 1819 South Central Avenue, Suite 72, Kent, Washington 98031

Contract No. 68-02-1283, RFP No. Du-74-B448 .... *$57,147*
CYTOGENETIC EFFECT OF OZONE AND NO2 IN HUMAN SUBJECTS.
North Carolina State University, P. O. Box 5487, Raleigh, North Carolina 27607 (NOTE: Contract contains options in the amount of $80,913)

Contract No. 68-02-1307, Modification No. 5 .... *$25,810*
FATE OF POLLUTANTS IN GASIFICATION (HYGAS).
Institute of Gas Technology, 3424 South State Street, IIT Center, Chicago, Illinois 60616

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily [illegible] characteristics of a specific class of emission sources including types, rates, industries [illegible]ondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

36517 **APTIC NO. 60187**

Bernert, Juergen

PROBLEMS WITH THE DETERMINATION AND LIMITATION OF ODOROUS EMISSIONS FROM PLANTS FOR MANUFACTURE OF PHARMACEUTICAL BASE SUBSTANCES. *(Probleme bei der Ermittlung und Begrenzung von Geruchstoff-Emissionen aus Anlagen zer Herstellung pharmazeutischer Grundsubstanzen). Text in German. Wasser Luft Betrieb, 18(1):38-41, 1974. 24 refs.*

The odor emissions from drying chestnut, valerian, and aloe extracts in the pharmaceutical industry were determined by measuring the total quantity of combustible organic (odor) substances. The waste gas was drawn through two successive quartz tubes filled with silica gel. The adsorbed organic substances were desorbed at 800 C and burned on a platinum catalyst in a dry, carbon dioxide-free oxygen flow. The CO2 formed at this process was determined by coulometry; the carbon content was calculated. Sampling lasted 20 minutes each time, the sampling speed was 1.51/min. Parallel analyses by gas chromatography were performed. The average total hydrocarbon emission from drying chestnut extracts was 259 mg C/cu m, with the total HC-fraction of the methanol being 133 mg/cu m, leaving an actual emission of the effective substance of 126 mg/cu m. For valerin, the total HC emission was 42 mg/cu m, including a total HC-fraction of the methanol of 27 mg/cu m. For aloe, the average total HC emission was 32 mg/cu m. A comparison of the maximum total HC emissions from drying of the three extracts with the existing emission standard of 150 mg/cu m shows that in the case of the chestnut extract, the emissions are above the standard, in the other two cases below it.

36518 **APTIC NO. 59640**

Bueters, K. A.

COMBUSTION PRODUCTS EMISSIVITY BY F SUB E OPERATOR. *Combustion, 45(9):12-18, March 1974. 6 refs.*

The empirical determination of F sub E by conducting furnace heat absorption profile measurements on operating tangentially-fired utility units is described. The emissivity factor is F sub E. Results have established a furnace average F sub E for gas and oil furnaces. The consequence of the F sub E determination was a significant improvement in the capability to predict axial absorption profiles and furnace outlet temperatures in the lower furnace. The match of predicted versus measured behavior is illustrated for gas and oil firing. These were selected from current data as being reasonably typical and indicate than an engineering approach to the problem of furnace analysis, in this instance, is entirely satisfactory from a designer s point of view. (Author summary modified)

36519 **APTIC NO. 60301**

Craig, Alfred B.

OVERVIEW OF THE FINE PARTICULATE PROBLEM. *Preprint, Joint U. S-U.S.S.R. Working Group on Stationary Source Air Pollution Control Technology, 33p., 1974. (Presented at the Symposium on Control of Fine Particulate Emissions from Industrial Sources, Jan. 15-18, 1974.)*

The problem of fine particulate emissions is reviewed in terms of air quality and new source performance standards, measurement techniques, major industrial sources, available control methods, and human health effects. Inertial impactors are currently being used by the Environmental Protection Agency to give reproducible particle size distribution and mass fractional efficiency data down to about 0.1 micron, and the Southern Research Institute under EPA sponsorship is using a series of diffusion batteries coupled with condensation nuclie counters to provide concentration and size distributions by number over the size range from about 0.01-0.3 micron. Particulate sulfate, the most abundant secondary fine particulate, appears to have a threshold health effect level about one order of magnitude lower than total suspended particulate, and the only obvious control strategy is precursor control (sulfur dioxide and catalyst materials). Locus of particulate deposition and time of retention in the respiratory system are both dependent on particle size; fine particles are retained for much longer periods of time. Probably the most efficient fine particulate control device tested by EPA to date is a high pressure steam scrubber developed by the Lone Star Steel Company; greater than 99% of all particulate can be removed down to 0.05 micron.

36520 **APTIC NO. 59291**

Forney, Albert J., William P. Haynes, Stanley J. Gasior, Glenn E. Johnson, and Joseph P. Strakey, Jr.

ANALYSIS OF TARS, CHARS, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS. *Pittsburgh Energy Research Center, Pittsburgh, Pa., Bureau of Mines Application of Improved Technology To Provide Clean Energy Program, Technical Progress Rept. 76, 12p., Jan. 1974. 4 refs.*

Results are presented from extensive analyses performed on the various effluents found in the Synthane coal-to-gas process. Large quantities of hydrogen, carbon monoxide, carbon dioxide, methane, and ethane are found in gasifier gases as well as a variety of trace components which include hydrogen sulfide, carbonyl sulfide, thiophene, methyl thiophene. dimethyl thiophene, benzene, toluene, C8 aromatics, sulfur dioxide, carbon disulfide, and methyl mercaptan. The sulfur compounds must be removed before methanation because of their poisoning effect on the nickel catalyst. Trace analyses of components in the gas have also revealed the presence of hydrogen cyanide and mercury. The low level of hydrogen cyanide indicates no serious problem; and mercury, although present in the gas from the gasifier, was not detected in the final product, i.e., high-Btu gas. Mercury and arsenic found in tars, if burned, would probably end up in the stack gas. Quantitative analysis results are given for tars, chars, gases, and water found in the process effluents.

36521 **APTIC NO. 60175**

Grawe, Joachim

SAFE POWER SUPPLY AND ENVIRONMENTAL PROTECTION. HOW THE CONFLICT OF INTEREST CAN BE SOLVED. *(Sichere Energieversorgung und Umweltschutz. Wie der Zielkonflikt bewaeltigt wird). Text in German. Umwelt (Duesseldorf), 4(2):32-37, 1974. 14 refs.*

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The demand for a safe supply of energy is in conflict with the demands for protection of the environment. At present, a reduction of the maximum allowable emission concentrations of sulfur dioxide is under consideration. In many areas where power plants are located, the new limits would be exceeded. In North Rhine Westphalia flue gas desulfurization has been declared ready for use in practice, and if the SO2 emissions cannot be reduced by the use of low-sulfur fuels, flue gas desulfurization can be demanded. The Ministry of the Interior of the Federal Republic of Germany intends to reduce the maximum allowable sulfur concentration in light fuel oil from 0.5% to 0.3% beginning with the winter of 1977/78. For heavy fuel oil, a reduction of the sulfur concentration has been likewise demanded. Until 1985 an upper limit of 0.8% shall be reached. The concerns with environmental pollution by power plants have lengthened the period between the decision to construct a new power plant and operation of it. It takes presently 4 to 5 years for fossil fueled power plants. As of Sept. 1, 1972 construction of 30 power plants was delayed because of concerns about environmental pollution. To meet the rising demands for energy it will become necessary to determine negative and positive effects of a planned power plant and to find a most satisfactory compromise between reduction of emissions and keeping up with the rising demand for power.

36522 **APTIC NO. 59362**

Hahn, Harry

STUDIES CONCERNING THE MERCURY CONCENTRATION OF NATURAL GASES. *(Untersuchungen ueber den Quecksilbergehalt von Erdgasen). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 115(3): 132-135, 1974. 5 refs.*

The mercury concentration in Groninger natural gas was measured photometrically by the dithizone method and by the flameless atomic absorption method. A description of both methods is given. With a few exceptions the measurements were taken in the high pressure supply lines at 40 to 60 bar. In the low-pressure supply lines the pressure was below 0.1 bar. In most cases Hg traces of less than 2 micrograms/cu m were measured. The maximum Hg concentration measured was 3.1 micrograms/cu m. These results agree well with measurements in Dutch natural gas supply lines. A large part of the Hg is separated during the transport in inactive form as mercury sulfide. At stoichiometric combustion of natural gas containing 3 micrograms Hg/cu m, this mercury concentration reduces to about 0.3 micrograms/cu m off-gas. Through additional natural dilution with air, the emission concentration is reduced to .001 of the maximum allowable working place concentration of 100 micrograms/cu m air, valid in the Federal Republic of Germany and in the United States.

36523 **APTIC NO. 60262**

Hurwitz, Melvin D.

ASSESSING THE HAZARD FROM BCME IN FORMALDEHYDE-CONTAINING ACRYLIC EMULSIONS. *Am. Dyestuff Reptr., 63(3):62-64, 77, March 1974. 6 refs.*

Laboratory experiments designed to measure the potential for generation of the carcinogen bis(chloromethyl)ether indicated that thermosetting emulsion polymers used in textile formulation for the bonding of non-woven fabrics are capable of being low level sources of the carcinogen. Application of the polymers to a non-woven web before drying and curing, however, revealed no detectable BCME (sensitivity 0.2 ppb) in both laboratory experiments and an actual mill test; the discrepancy is best explained by the facile release of formaldehyde from a non-woven web or, in the case of a cellulosic, by effective competition of the reaction of formaldehyde with cellulose rather than with chloride ion. The potential for BCME increases with available chloride and formaldehyde. The actual hazard under mill conditions appears to be substantially less than the maximum potential hazard; nevertheless, working areas should be monitored to insure that adequate ventilation exists.

36524 **APTIC NO. 59632**

Kato, Tatsuo and Keiro Sugimoto

ENVIRONMENTAL POLLUTION BY MANGANESE DUST FROM FURNACE. *(Mangan baijin ni yoru kankyo osen). Text in Japanese. Anzen Kogaku (J. Japan. Soc. Eng.), 13(1):13-19, Feb. 1974.*

The principal sources of manganese dust pollution in Namerikawa city, Toyama Prefecture, are three furnaces. A causal relation between the dust pollution and these furnaces was studied. The dust accumulated on house gutters, dust in rice field soil, and airborne dust were collected. After extraction of metallic manganese in these materials, the content of manganese was determined by the atomic absorption method. Using the data at 118 points, a quantitative distribution of the dust pollution in the area was plotted. The pollution zone extended from north to south of the city, and was about 4 km long and 2 km wide. The zone corresponded with the average wind direction throughout the year. When dust collectors were attached to the furnaces, there was no manganese diffusion in the city.

36525 **APTIC NO. 59890**

Masek, Vaclav

SOOT IN WORKING PLACES OF A METALLURGICAL PLANT. *(Russ in Arbeitsstaetten eines Huettenunternehmens). Text in German. Zbl. Arbeitsmed., 24(2):38-46, 1974. 12 refs.*

Soot, the product of incomplete combustion, is present in the atmosphere together with dust and gaseous emissions. Compared to soot made from vaseline oil, soot from the combustion of hard or soft coal or wood has a smaller surface and a significantly higher ash concentration which contains, among other things, iron, sulfur, arsenic, and silica. All types of soot contain carcinogenic benzo(3,4)pyrene, although in different quantities. Soot has reducing properties which are most pronounced with pure extracted soot. Soot can be degassed in the inert atmosphere of argon. The process can be thermogravimetrically pursued up to 1000 C. The degassing process and the total quantity of volatile substances is not specific for any kind of soot. Determination of the soot content in 19 samples taken at selected places in a metallurgical plant over a period of three years confirmed improvements achieved with technological measures and modernization of equipment. Pictures taken with the scanning electron microscope revealed that all soot particles in the metallurgical plant were spherical and partly combined to chains.

36526 **APTIC NO. 59272**

O Mara, Michael M.

THE COMBUSTION PRODUCTS FROM SYNTHETIC AND NATURAL PRODUCTS -- PART 1: WOOD. *F. Fire Flammability, 5(1):34-53, Jan. 1974. 32 refs.*

The major sources of life hazard in a fire are flame and superheated air, oxygen depletion, toxic gases, and smoke. Some of the combustion products may have a synergistic effect. A gas chromatograph was interfaced to an NBS Smoke Chamber to study the rate of generation of carbon monoxide and other gases during the burning of various materials. The effect of environmental oxygen concentration on the release of CO was also studied. The presence of other combustion and degradation products were qualitatively and semi-quantitatively determined. The combustion of cellulose produced carbon dioxide and carbon monoxide. Plywood production produced CO2 and CO in varying ratios; the CO2/CO ratio decreased then increased during exposure due to changing CO2 concentrations, since CO concentrations remained constant. Results for white oak were similar; the ratio of CO2/CO minimized and the concentration of smoke maximized early in the combustion process. Dry and humid white pine samples were burned; the moisture content of the wood affected both the CO formation and the development of smoke. As the progression was made from dry to wet pine, CO, CO2, and smoke generation decreased. During masonite (hardboard) combustion, the CO2/CO ratio minimized before smoke maximized. Combustion of masonite in reduced oxygen atmospheres showed CO2 production was more dependent on the concentration of oxygen than CO production. Above 10% oxygen, the amount of CO which is released and which escapes combustion remains constant. The different wood products generated CO at different rates. At 15 minutes, for example, plywood, white oak, white pine, and masonite combustion produced 3025, 2900, 2789, and 2040 ppm CO, respectively, which were 1.48, 1.51, 1.36, and 1.0 relative CO concentrations. The differences were due to combustion rates, weight loss, and the chemical composition of the particular wood. The generation of other combustion products such as methane, ethylene, propylene, methyl alcohol, acetaldehyde, acetic acid, and other products was also studied in the smoke chamber by a gas chromatograph and chromatographic column. The procedure for determining the combustion products is described.

36527 **APTIC NO. 59354**

Rosen, Gerald

FUNDAMENTAL THEORETICAL CONSIDERATIONS FOR AN AIR-SUSPENSION VORTEX FLOW INCINERATOR SYSTEM. *Chem. Eng. Sci., 29(1):97-104, Jan. 1974. 19 refs.*

The basic fluid dynamic and combustion theory underlying an air-suspension vortex flow incinerator system is presented, and the times required for drying, pyrolysis, and char burn-out of the fuel particles are mathematically derived. The flow is assumed steady and axially symmetric, and the Mach number is assumed small everywhere. Preliminary estimates for volumetric rates of production of gas and heat are also deduced from the theory. (Author abstract modified)

36528 **APTIC NO. 60162**

Schwarzbach, Eberhard

ELIMINATION OF CYANIDE-CONTAINING WASTE WATER IN A BOILER PLANT. *(Vernichtung cyanidhaltiger Abwaesser in einer Heizkesselanlage). Text in German. Wasser Luft Betrieb, 18(1):26-27, 1974. 5 refs.*

In a factory which electroplates small parts with brass, the incineration of the cyanide waste water was attempted. For this purpose a tubular kiln which could be fired with wood or light fuel oil was used. Upon entry of the aqueous cyanide solution or suspension into the combustion chamber where a temperature of 800 C prevails the water evaporates, enriching the reaction zone with water vapor. Apart from the hydrolytic dissociation of the cyanide, an oxidation to canate (NaCNO) takes place in the presences of surplus oxygen. The cyanate is further broken down to nitrogen nitrogen oxides, carbon oxides, and alkali oxides. The oxides of nitrogen dissociate upon passage of the temperature zone 700 to 1000 C. The emissions by this boiler were measured with an Orsat analyzer. The results show that the remaining traces of CN are 60 micrograms/cu m in waste gas at the most and on the average less than 30 micrograms/cu m.

36529 **APTIC NO. 60177**

Shimamura, H.

PRESENT SITUATION AND FORECAST OF PETROLEUM REFINING INDUSTRY IN JAPAN. *(Sekiyu seisei no genjo to shorai). Text in Japanese. Sekiyu Gakkai shi (J. Japan. Petroleum Inst., Tokyo), 17(1):7-10, Jan. 1974.*

The petroleum refining industry in Japan has a crude oil refining capacity of 4,900,000 BPSD and will attain an annual production of 240,000,000 kl in March 1973. The history of its development and future problems which the industry will encounter and should solve are discussed, with special reference given to unleaded gasoline and heavy oil desulfurization. A high octane number (95 or higher) is difficult to obtain with conventional unleaded gasoline and production of isoparaffin is not favorable because of its environmental impact. Neohexanes obtained by alkylation of ethylene and isobutane over aluminum chloride catalyst is expected to improve the octane number. The air quality standard for sulfur oxides allows less than 0.1 ppm for 1 hr and 0.004 ppm or less for a 1-day average of 1-hour values. In order to meet this standard, heavy oil desulfurization must be utilized. Gasification desulfurization processes heavy oil cracking, partial oxidation processes, and solvent deasphalting processes are described. Also nitrogen oxides are another problem in oil combustion. The use of distillate oil may reduce the problems of sulfur and NOx.

36530 **APTIC NO. 59888**

Siegert, H., H. H. Oelert, and J. Zajontz

RAPID GAS CHROMATOGRAPHIC ANALYSIS FOR INDIVIDUAL HYDROCARBONS IN THE EXHAUSTS OF DIESEL ENGINES. *(Schnelle gaschrotographische Analyse fuer individuelle Kohlenwasserstoffe in den Abgasen von Dieselmotoren). Text in German. Motortech. Z. (Stuttgart), 35(4):101-106, April 1974. 7 refs.*

The hydrocarbon emission by a four-cylinder four-stroke diesel engine with 60 hp and 3000 rpm and a piston displacement of 2976 cu cm was determined by gas chromatography. The gas chromatograph was operated with two identical columns of 1000 mm length and an inner diameter of 2.6 mm packed with 2.64 g Durapak n-Octane (120 to 150 mesh). The exhausts of various stationary operating conditions of the engine were analyzed. The revolutions were varied between 1000, 2000, and 3000 rpm. For 1000 rpm, a rising trend of the concentration of the hydrocarbon fractions with the load was discernible. At high load, the concentration of hydrocarbons with six to eight C-atoms was strikingly high and dropped with increasing rpm. This load dependence of the concentrations is not as pronounced any more with higher rpm. The concentration levels of the hydrocarbon fractions over the entire load range differed clearly for the individual revolution number. At 1000 rpm, heavily cracked fractions and unburned hydrocarbons reached concentrations which were two to three times higher than at higher revolution numbers. The composition of the used diesel fuel is illustrated. It becomes apparent that the concentrations of the different hydrocarbons assume a different characteristic in the exhaust gas than in the fuel. For C-numbers higher than 13, the concentrations of the components in the fuel dropped rapidly while they increased in the exhaust gas. The relationship of some identified hydrocarbons with the engine parameters are discussed. For instance, the concentration of butene-1 with regard to the load and the revolution number as a parameter is graphically illustrated. The concentration was low at 2000 rpm, reached a pronounced maximum at 3000 rpm in the upper load range, and increased linearly with the load at 1000 rpm. Concentrations up to 12 ppm C are reached. Similar relationships were obtained for the other 1-olefins with three to seven C-atoms.

36531 **APTIC NO. 59612**

Thompson, D.

NITRIC OXIDE FORMATION IN INDUSTRIAL COMBUSTORS. *Experientia Suppl., no. 20:145-155, 1974. 15 refs.*

Experimental investigation of fuel-lean premixed methane-air combustion gave agreement between observed nitric oxide formation rates and those predicted by the Zeldovich mechanism when non equilibration of atomic and molecular oxygen concentrations was taken into account and illustrated the possibility for offering design criteria of a combustor with an acceptably high throughput and good pollution control. The criteria in their most general form are that the flame (premixed) should have a structure such that the high temperature zones are sufficiently well separated from the flame itself that physical access may be gained to them without interference with the flame processes; cooling should be rapid in these zones. The commonly available fuels suitable for use in the type of burner proposed are methane (natural gas), propane, butane, towns gas, gasoline, and kerosene with the aid of a well-designed heater. The characteristics of power stations and stationary combustors appear to be generally compatible with the basic requirements since a solid heat exchanger is used; the heat transfer efficiency of the exchanger near the flame need only be modest, and a robust design with satisfactory service life under the stringent conditions demanded is feasible. The major limitation at present is probably the extensive use of heavy fuel oil. Preference for an alternative system to the internal combustion engine in the motive power field is indicated, and several alternative power sources are examined.

36532 **APTIC NO. 59359**

Wettig, K., P. Lebahn, and H. Hoehne

EXAMINATION OF THE CO CONCENTRATION OF AUTOMOBILE EXHAUSTS. *(Untersuchungen des CO-Gehalts in Kraftfahrzeugabgasen). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(2): 88-90, 1974. 1 ref.*

In the district Oranienburg in the German Democratic Republic, the carbon monoxide emission of exhaust gases of automobiles was measured with an infrared analyzer. Nearly half of the automobiles tested had been driven less than 20,000 km. Of the 271 examined automobiles, 40.5% exceeded the maximum allowable emission concentration of 4.5% by volume. The frequency distribution shows that nearly 70% of the automobile emissions of CO were between 1.6 and 6.0% by volume. Of the four-stroke engines, 61.6% exceeded the maximum allowable emission concentration, versus 32.7% of the two-stroke engines. Among the examined four-stroke engines, a large number measured CO concentrations of higher than 9%. Since the upper detection limit of the analyzer was 10%, values higher than this could no longer be determined. Through adequate adjustment of the carburetor, a reduction of the CO emission by 29% could be achieved with all automobiles; with those automobiles which exceeded the maximum allowable emission concentration, a 55% reduction could be achieved.

36533 **APTIC NO. 59465**

Environmental Protection Agency, Washington, D. C., Hearing Panel

NATIONAL PUBLIC HEARINGS ON POWER PLANT COMPLIANCE WITH SULFUR OXIDE AIR POLLUTION REGULATIONS. (FINAL REPORT). *112p., Jan. 1974. 76 refs.*

An assessment was made by an Environmental Protection Agency hearing panel on the status of power plant compliance with sulfur dioxide air pollution emission limitations. Principle findings were as follows: flue gas desulfurization technology must be installed on large numbers of power plants if SOx emission requirements are to be met in the 1970 s since supplies of low-sulfur fuels are and will continue to be inadequate as a sole means of compliance with the emission limitations; many established SOx emission limitations will not be met by the mid-1975 compliance date of Most State implementation plans and will not be met at all unless the electric utility industry makes the necessary commitments to install flue gas desulfurization systems where needed; the electric utility industry has not aggressively sought out solutions to the problems they argue exist with flue gas desulfurization technology; the reliability of both throwaway-product and saleable product desulfurization systems has been sufficiently demonstrated on full scale units to warrant widespread commitments to such systems for SOx control at coal and oil-fired power plants; and the utility industry has generally lacked a real incentive to develop and install flue gas desulfurization technology.

36534 **APTIC NO. 60145**

FURNACE CONSTRUCTIONS FOR INCINERATION. *(Ofenkonstruktionen fuer die Abfallverbrennung). Text in German. Wasser Luft Betrieb, 18(1):28-30, 1974.*

Various kinds of furnaces for the incineration of a wide variety of waste products such as odorous waste gases, communal and industrial sludges, and solid wastes are described. For example, sewage sludge is incinerated in a fluidized bed furnace. The combustion temperature of about 800 C assures that the volatile organic sludge components are completely oxidized, leaving the waste gases free of odors. In radiation recuperators, a large part of the heat of the waste gas is transferred to the combustion air and returned to the process. The waste gases are cooled to 350 C and cleaned from dust in electrostatic precipitators. A rotary kiln is described that burns everything from solvents and chlorinated hydrocarbons to peroxides and metallic sodium. In another incinerator for liquid and gaseous wastes with heat utilization, the liquid waste products are injected into the combustion chamber via concentrically arranged burners. The auxiliary fuel is injected through a number of fine nozzles. The heated odorous waste gas, containing mercaptans, hydrogen sulfide, and nitrogen oxides, is used as combustion air. Sulfur dioxide and hydrogen chloride are removed by scrubbers.

1973

36535 **APTIC NO. 59742**

Anderson, David

EMISSION FACTORS FOR TRACE SUBSTANCES (FINAL REPORT). *Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, Environmental Protection Agency-450/2-73-001, 82p., Dec. 1973. 105 refs.*

NTIS: PB 230894/AS

Emission factors are presented for eight trace pollutants: arsenic, asbestos, beryllium, cadmium, manganese, mercury, nickel, and vanadium. Emission data on which these factors are based were obtained from source tests, material balance studies, and engineering estimates and are applicable to air pollution inventories. Emission factors cover most of the common emission categories: mining, metallurgical, secondary metal industry, processing and utilization, consumption uses, fuel combustion, and waste incineration. When no source test data are available, these factors can be used to estimate the quantities of trace pollutants being released from a source or source group. (Author abstract modified)

36536 **APTIC NO. 59519**

Barrett, R. E., S. E. Miller, and D. W. Locklin

FIELD INVESTIGATION OF EMISSIONS FROM COMBUSTION EQUIPMENT FOR SPACE HEATING (DATA SUPPLEMENT) (FINAL REPORT). *Battelle, Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-0251, Program Element No. 1A2015, EPA-R2-73-084b, 225p., June 1973.*

A data supplement to a study entitled Field Investigation of Emissions from Combustion Equipment for Space Heating is presented which records individual data points and plots in greater detail than in the main volume of the report. Data is included from 13 residential heating units and six commercial boilers investigated under different combustion conditions during Phase II of the program. This supplement contains emissions data, plots of emissions versus carbon dioxide, computed emission factors, and emission concentrations calculated at 3% oxygen for such pollutants as nitrogen oxides, particulates, carbon monoxide, hydrocarbons, and sulfur oxides. (Author abstract modified)

36537 **APTIC NO. 59479**

Castleman, A. W., Jr., H. R. Munkelwitz, and B. Manowitz

CONTRIBUTION OF VOLCANIC SULPHUR COMPOUNDS TO THE STRATOSPHERIC AEROSOL LAYER. *Nature (London), 244(5415):345-346, Aug. 10, 1973. 5 refs.*

The contribution of volcanic sulfur compounds to the stratospheric aerosol layer was studied by comparing sulfur concentrations and 32S/34S isotopic ratios of selected stratospheric and tropospheric aerosol samples with the dates and locations of major volcanic eruptions. A clear correlation between sulfur concentration (expressed in micrograms of sulfate per standard cu m of filtered air) and volcanic activity was observed, with sulfate aerosol concentration in the Junge layer located south of the equator increasing two orders of magnitude within a year after the catastrophic 1963 eruption of Mount Agung. Positive del values of the stratospheric samples collected shortly after the eruptions undoubtedly resulted from a weighted average of the value for the injected tephra and the limited quantity of particles formed by the conversion of gases to particles in the rising plume along with pre-existing material in the stratosphere. A subsequent abrupt decline in del value with time indicated a depletion of the 34S isotope with respect to meteoritic sulfur for the aerosol particles being sampled, suggesting a fractionation of the isotopes of sulfur during exposure to a reactive chemical environment.

36538 **APTIC NO. 59752**

Danielson, John A. (ed.)

AIR POLLUTION ENGINEERING MANUAL. SECOND EDITION. *Research Triangle Park, N. C., Environmental Protection Agency, Office of Air Quality Planning and Standards, AP-40, 1973, 1014p. 341 refs.*

NTIS: PB-225132/OAS

Practical engineering problems of design and operation associated with the many sources of air pollution are emphasized in the second edition of the Air Pollution Engineering Manual. These sources include metallurgical, mechanical, incineration, combustion, petroleum, chemical, and organic solvent emitting processes. The manual consists of 12 chapters, each by different authors, and 5 appendices. The first five chapters treat the history of air pollution in Los Angeles County, the types of contaminants, and the design of air pollution control devices. The remaining chapters discuss the control of air pollution from specific sources. The appendices contain the rules and regulations of the air pollution control district of Los Angeles County, odor testing techniques, hypothetical available heats from natural gas, a discussion of emission surveys, inventories, and factors. There is a detailed subject index.

36539 **APTIC NO. 59370**

Diamant, W.

STUDY OF DIPHASIC FLOWS. RELATION BETWEEN SMOKE STRUCTURE AND THE COMBUSTION OF HYDROCARBONS. *(Etude des ecoulements diphasiques. Relation existant entre la structure des fumees et la combustion des hydrocarbures). Text in French. Rev. Gen. Thermique (Paris), 12(142):953-969, Oct. 1973. 19 refs.*

Relationships between the combustion conditions of fuel oils with different sulfur contents and the unburned hydrocarbon emissions were studied. The air excess coefficient, the atomization pressure, the fuel temperature, and the fuel oil sulfur content influenced the combustion quality, and consequently the unburned hydrocarbon emissions. Increased atomization pressure which determines the fuel droplet size, does not necessarily lead to reduction in the unburned hydrocarbon concentration. Efficient atomization should result in good in-space distribution, but Gaussian particle size distribution should be maintained for low pressure injection. When varying the air excess from 17% (carbon dioxide concentration 13%) to 100% (CO2 concentration 7.7%), the unburned hydrocarbon particle concentration varied from 100,000,000,000 to 2,000,000,000,000 particles/cu m. Increase in the unburned hydrocarbon emission with increasing fuel sulfur content was observed. The particulate emission was 0.05 g/kg of fuel in the case of a fuel oil with 0.48% sulfur, and 1 g/kg for another fuel oil with a sulfur content of 1.68%.

36540 **APTIC NO. 59241**

Edgeworth, L.

CANADA S APPROACH TO ENVIRONMENTAL POLLUTION CONTROL FOR THE PULP AND PAPER INDUSTRY. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 103-112, (May 7-11.)*

Environmental air pollution control in Canada for the pulp and paper industry is discussed. The most important characteristic is that it is based on point source control and on best practical technology. Compliance schedules distinguish between the situation of the old and new plants. The standards are uniform across Canada. The Clean Air Act recognizes the direct authority of the provincial governments. National air quality objectives were recently established and define contaminates in various levels ranging from desirable through tolerable. The Act also allows for the regulation of the composition of fuels. Detailed inventories of specific contaminants are being compiled on a national scale.

36541 **APTIC NO. 60176**

Garibaldi, P., M. Zerra, and N. Passarini

LEAD COMPOUNDS IN GASOLINE ENGINE EXHAUST GASES. PART I: EXHAUST LEAD EMISSION AS A FUNCTION OF THE LEAD CONTENT IN THE GASOLINE. LEAD BUDGET. *(Composti di piombo nei gas di scarico dei motori a benzina. I. Piombo emesso allo scarico in funzione del tenore in piombo della benzina. Bilancio del piombo). Text in Italian. Riv. i Combust. (Milan), 27(11-12):505-511, Nov.-Dec. 1973. 9 refs.*

Lead contents in the exhaust gas, in the engine combustion chamber, the cooling liquid, and in the motor oil were determined in an 1970 FIAT engine that was tested on a test stand with gasolines containing 0.60; 0.40; 0.30, and 0.15 g of lead per liter by simulating city traffic conditions in an engine speed range of 1000-2500 rpm. The exhaust lead samples were taken by means of glass wool filter. In short-term tests with gasolines containing 0.15, 0.40, and 0.60 g of lead per liter, corresponding to a total lead input of 15, 20, and 30 g, the quantities of lead emitted in the exhaust gas were 9.90, 13.90, and 26.50% of the total lead. The percentages of lead deposited in the exhaust pipe were 21.47, 23.30, and 25.07%, while the corresponding percentages for the lead quantities in the cooling liquid and in the motor oil were 16.20, 18.15, and 17.63%. The quantities of lead deposited in the combustion chamber and in the exhaust pot were 38.13, 30.20, and 22.53%. In long-term tests with gasolines containing 0.15, 0.30, and 0.60 g of lead per liter, corresponding to total lead inputs of 73.99, 93.85, and 300 g, the respective percentages of lead emitted in the exhaust gas were 37.84%, 39.29%, and 36.65%.

36542 **APTIC NO. 59530**

German, R. C., M. D. High, and C. E. Robinson

MEASUREMENT OF EXHAUST EMISSION FROM A J85-GE-5B ENGINE AT SIMULATED HIGH-ALTITUDE, SUPERSONIC, FREE-STREAM FLIGHT CONDITIONS. *Arnold Engineering Development Center, Arnold Air Force Station, Tenn., Propulsion Wind Tunnel Facility, Dept. of Transportation Contract DOT-AS-20024, Program Element 921K, ARO, Inc. Proj. PA038 and PB038, AEDC-TR-73-103, ARO-PWT-TR-73-49, FAA-RD-73-92, 138p., July 1973. 16 refs.*

NTIS, DDC: AD 764717

Exhaust emissions were measured in the plume of a J85-GE-5 turbojet engine as part of an investigation to determine the impact on the climate of a fleet of supersonic aircraft flying in the stratosphere. Measurements were made at three axial stations (0.22, 9.3, and 19.9 nozzle diameters) downstream of the nozzle exit for both military and partial afterburning power at Mach numbers and simulated altitudes of Mach 1.6/55,000 ft and Mach 2.0/65,000 ft A continuous sampling technique used to measure carbon dioxide, carbon monoxide, total unburned hydrocarbons, oxides of nitrogen, and particulates. The experimental results were compared with the calculated emission profiles and were in good agreement. The results represent the only available full-scale turbojet engine emission data to date which have been obtained at simulated high altitude with a supersonic external stream. (Author abstract)

36543 **APTIC NO. 59882**

Gouezo, F., M. J. Sommer, J. Fondarai, and A. Viala

STUDY OF THE VARIATIONS OF THE CARBON MONOXIDE CONCENTRATIONS AS A FUNCTION OF THE AUTOMOBILE TRAFFIC IN A DOWNTOWN STREET IN MARSEILLE. *(Etude des variations de la pollution oxycarbonee en fonction des conditions de circulation automobile dans une rue du centre de Marseille). Text in French. Travaux Soc. Pharm. Montpellier, 33(3):441-452, 1973. 4 refs.*

The influence of different traffic conditions on the carbon monoxide concentrations in a downtown street in Marseille was studied by systematic CO concentration measurements. With normal, free one-way traffic with parking on one side of the street, the daily average CO concentration in the street air was 16.7-19.1 ppm. When the street was reserved for two-way traffic for public transportation only with parking ban, the average CO concentration fell to 3.6-8.15 ppm. When only one lane was preserved for public transportation in two-way traffic and with parking banned, the CO concentrations averaged 11.6 ppm. Cars parking at the curb interfered with the diffusion of the CO to the adjacent sidewalk. The hourly pattern of the CO concentrations largely corresponded to that of the traffic density.

36544 **APTIC NO. 59733**

Hall, R., J. Bartlett, and N. Surprenant

STATE OF UTAH. COMPILATION OF NEDS DATA. *GCA Corp., Bedford, Mass., GCA Technology Div., Environmental Protection Agency Contract 68-02-1006, Task Order 2, EPA-450/3-74-005, 51p., Dec. 1973. 16 refs.*

NTIS: PB 230891/AS

Point and area source data for updating the National Emission Data System are presented for the state of Utah. Point sources with the potential to emit over 25 tons/year of any of the five major pollutants (particulates, sulfur dioxide, nitrogen oxides, hydrocarbons, and carbon monoxide) are included. A grid system for the Davis, Salt Lake, and Weber County areas presents the geographical distribution of emissions in the area of the highest emissions. Emission contributors include industrial, nonindustrial, and transportation sources.

36545 **APTIC NO. 59982**

Ikari, Masanori

ON CENTRALIZED LOCAL HEATING/COOLING FACILITIES IN SHINJUKU, A NEW METROPOLITAN CENTER, AND THEIR AIR POLLUTION PREVENTION EFFECTS (PREDICTED). *(Shinjuku shintoshin ni okeru chiiki reidanbo setsubi to taiki osen boshi koka (yosoku)). Text in Japanese. Kuki Seijo (Clean Air-J. Japan. Air Cleaning Assoc., Tokyo), 11 (Supplement 1):32-47, 1973.*

As a part of the metropolitan redevelopment program, the Tokyo Gas Co. is building a centralized heating and cooling system for all the new buildings that will be built in a 164,000 sq m area. Those buildings the centralized or district heating/cooling facilities will be servicing require 15,900 RT for cooling and 83 tons/h of steam for heating. The economical advantages of a centralized system such as lower installation cost, more effective utilization of fuel, fewer maintenance personnel, and effective utilization of the building space are discussed. Based on the theoretical estimation of total loads required for cooling and heating, the final capacity of cooling equipment will be 41,000 RT while that of heating equipment (boiler) should be 210 tons/h. The equipment is fueled by city gas to reduce air pollution to a minimum. Theoretical sulfur dioxide emissions are compared for individual heating/cooling systems using heavy oil fuel and the centralized district system fueled by city gas. The SO2 emission can be annually reduced to 1/56 with the latter system.

36546 **APTIC NO. 59300**

Junod, A. and P. Lehmann

RECOMMENDATIONS FOR THE UNIFORM SIZING OF CHIMNEYS BASED ON SIMPLE METEOROLOGICAL STATISTICS AND LONG-RANGE NORMS. *(Ein Vorschlag zur einheitlichen Dimensionierung von Schornsteinen mittels einfacher meteorologischer Statistiken und Langzeitnormen). Text in German. V.D.I. (Ver. Deut. Ingr.) Ber., no. 200:63-72, 1973.*

A uniform method for determining the maximum allowable increase in ambient concentration due to a new stack is presented. Methods are examined for obtaining long-range time averages of ambient conditions near point sources from meteorological statistics in order to include long-range standards for air quality, and the dependency of the loading factor on time averages is also considered. The fact that additional sources may be placed in the vicinity of a chimney at some subsequent time can be taken into consideration by arranging for a new chimney to produce only a part of the maximum allowable ambient concentration; and whatever the equation or method used for determining the stack height, a value for the maximum allowable increase in ambient concentration due to the new chimney must be included.

36547 **APTIC NO. 59885**

Khasanov, Yu. U. and E. N. Davletov

HYGIENIC EVALUATION OF THE USE OF HELICOPTERS FOR DEFOLIANT APPLICATION. *(K gigiyenicheskoy otsenke vertoletnogo sposoba defoliatsii). Text in Russian. Gigiena i Sanit., no. 10:103-104, 1973.*

Butyphos concentrations occurring inside and outside helicopters used for the application of this defoliant on the charging site and in the air over the site of application were studied. The air temperature was 22-28 C, the relative humidity ranged from 59 to 68%, and the wind speed was 0.6-4 m/sec during defoliant application. The butyphos expenditure was 2.5 kg/ha or 100 l solution per ha. The butyphos concentration on the charging site was 0.1 mg/cu m, but exceeded the maximum allowable concentration by 50% inside the cockpit with 0.3 mg/cu m. The butyphos concentration in the air was below the maximum allowable concentration at 500 m from the field treated on the day of butyphos application. The butyphos concentration over the field treated fell below the maximum allowable value in 4 days.

36548 **APTIC NO. 59766**

Kircher, David S. and Donald P. Armstrong

AN INTERIM REPORT ON MOTOR VEHICLE EMISSION ESTIMATION. *Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, EPA-450/2-73-003, 44p., Oct. 1973. 30 refs.*

NTIS: PB 230931/AS

New gasoline-powered motor vehicle (light-duty and heavy-duty) emission factors for carbon monoxide, hydrocarbons, and nitrogen oxides are presented based on a recent nationwide study of over 1000 automobiles. These factors account for such variables as the model year, deterioration, and average speed differences. Sample calculations are included to illustrate the method of obtaining emission factors that are most representative of a particular region, vehicle mix (age and type), and average speed. Methods are given for obtaining estimates of area wide emissions attributed to gasoline-powered vehicles. Local traffic survey data, Dept. of Transportation Studies, and other private surveys are used. The emissions contribution from other mobile sources is calculated using the values in Compilation of Air Pollutant Emission Factors. The new emission factors allow a more accurate computation of air quality whether a proportional or a diffusion model is used. They also permit calculation of the differences between alternative transportation systems without determining the absolute values of air quality levels. (Author abstract modified)

36549 **APTIC NO. 59256**

Laster, L. L.

ATMOSPHERIC EMISSIONS FROM THE PETROLEUM REFINING INDUSTRY. (FINAL REPORT). *National Environmental Research Center, Research Triangle Park, N. C., Control Systems Lab., Program Element 1A2013, EPA-650/2-73-017, 56p., Aug. 1973. 35 refs.*

NTIS: PB-225 040/5 AS

The air pollution problems of the petroleum refining industry are summarized with emphasis on gaseous emissions. THe principal emissions from refining operations are sulfur oxides, nitrogen oxides, hydrocarbons, particulates, carbon monoxide, and odors. The estimated emissions of these pollutants (except odor) at the 262 refineries operating in the United States in 1969 totaled 7.04 million tons with substantial control exercised only in the case of hydrocarbons, particulates, and CO. In accordance with guidelines proposed by the U. S. Environmental Protection Agency for emissions from refinery operations, oil companies, working in conjunction with trade organizations and equipment manufacturers,, have employed interim controls in many cases and have developed processes and devices for at least reducing all pollutants from refineries. (Author abstract modified)

36550 **APTIC NO. 59558**

Lekander, K. E.

THE POLLUTION FREE MILL: FACTS AND VISIONS. *European Liaison Commiteee for Cellulose and Paper, Proc. EUCEPA Conf., 15th. Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 161-170, 178-181. (May 7-11.)*

The source of odor in the pulp and paper industry in Sweden is discussed. The noxious odor of the kraft mill has been ascribed to the recovery boiler. However, if the boiler is properly dimensioned and is always fed thick liquor with a high and even solid content, the recovery boiler will be an important source of the odor only in exceptional cases. At one mill less than 10% of the odor came from the recovery boiler stack. The main sources were the lime kiln and diffuse discharges from cooking and washing. The diffuse odor gases can to a great deal be collected and added as secondary air into a boiler. The gas points can be ventilated into the lime kiln or a special furnace together with the gases from the condensate stripping. The odor from the lime kiln refers to insufficient mud washing and other detailed reasons. The sulfur dioxide pollution from the liquor burning in a calcium-based mill will not probably become lower than 30-40 kilos/ton of pulp even with a flue gas scrubber. To the modern soluble bases sulfite mills the SO2 discharge from the stack is no problem and can be easily be mastered by a correctly performed absorption scrubber system.

36551 **APTIC NO. 59560**

Lieben, P.

AN OECD STUDY ON POLLUTION BY THE PULP AND PAPER INDUSTRY. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 29-36, 109-112. (May 7-11.)*

Air pollution in the pulp and paper industry is discussed in a summary of an OECD study on present conditions in environmental pollution. The main air pollutants are particulate matter, sulfur dioxide, and odorous compounds of sulfur as hydrogen sulfide and various mercaptans. Odorous gases are emitted during the manufacture of sulfate pulp and also SO2 from the recovery boilers in the calcium-based sulfite process. The implementation of planned pollution control problems in the various countries should lead by 1980 to a 65-70% reduction in suspended matter and BOD. New manufacturing processes are being investigated to reduce odorous gases, but application on an industrial scale before 1980 is doubtful. Legislation regarding air pollution is less advanced than for water pollution and is often badly defined. By 1975, averaged over all participating countries, pollution control costs are expected to rise for sulfate pulp approximately 1% in 1970 to a level of 2.4 to 5.8% in 1975.

36552 **APTIC NO. 59924**

Macfarlane, C., J. B. Lee, and M. B. Evans

THE QUALITATIVE COMPOSITION OF PEAK SMOKE. *J. Inst. Brewing, 79(3):202-209, 1973. 6 refs.*

Peak smoke, a result of smouldering peat fires used in the kilning of malt, was distilled to obtain compounds with boiling points which should not preclude their presence in malt whisky. An oil and an aqueous phase were obtained and analyzed separately using gas-liquid chromatography, thin-layer chromatography, and a combination of GLC and mass spectrometry. A number of monohydric phenols, two furan aldehydes, and three series of hydrocarbons (alkanes, alkenes, and aromatics) were found along with naphthalene and methylnaphthalene. (Author abstract modified)

36553 **APTIC NO. 59257**

Magee, E. M., H. J. Hall, and G. M. Varga, Jr.

POTENTIAL POLLUTANTS IN FOSSIL FUELS. (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., U. S. Environmental Protection Agency Contract 68-02-0629, Program Element 1A2013, EPA-R2-73-249, GRU. 2DJ.73., 300p., June 1973. 110 refs.*

Data obtained from the literature on sulfur, nitrogen, and other potential pollutants in fossil fuels in the United States are presented. The data are categorized according to the location of the raw fuels, and are analyzed for geographic effects on composition. Good data and useful correlations with source locations are available for petroleum sulfur, nitrogen, and nickel/vanadium, but not for other potential pollutants. A large amount of data is presented for trace elements in coal and nearly complete data are available for sulfur. Additional data include: spectrochemical analyses of coal ash for trace elements, rare elements in coal, mercury in coal, determination of arsenic in coal, colorimetric determination of beryllium, chemical analysis for germanium and gallium in head samples of fly ash and flue dust, spectrochemical analysis of coal ash, and method for determination of fluorine in coal.

36554 **APTIC NO. 59282**

Masuda, Nobuo and Takahiko Suzuki

COMBUSTION CHARACTERISTICS OF RECIRCULATING BURNER. *(Junkan nenshoshiki bana no nensho tokusei (dainiho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):348, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The amount of nitric oxide in the combustion gas of the Daido caloric burner, a recirculating burner introduced last year, was examined changing the fuels and combustion conditions. The caloric burner was not developed as a low NOx burner in particular, but as an all-purpose burner. With fuel oil, the maximum NO formation was 75 ppm, and with kerosene, the maximum was 63 ppm. Under the same conditions, the less the molecular weight of fuel compositions, the less NO formation was generated. The temperature of combustion, and also in an actual plant, the temperature in the furnace were influential in the formation of NO. The use of city gas or LNG will decrease NO to 35-40 ppm.

36555 **APTIC NO. 59226**

Noel, Thomas M.

TEXTILE AIR POLLUTION PROBLEMS AS SEEN BY A STATE CONTROL AGENCY. *Preprint, Rhode Island State Dept. of Health, 8p., 1973.*

Air pollution problems are reviewed for the textile dyeing and finishing industry in Rhode Island. Major pollutant sources in the industry are tenter frames and other high-temperature dryers, and the pollutants emitted include residual spinning and knitting oils, carriers, and other organics volatilized from the fabric and exhausted to the outside air as an odorous blue smoke. The problem is considered primarily a serious nuisance in Rhode Island. Identification of the sources has been by complaints and observation by field inspectors, while abatement action has been a result of enforcement of visible emission and nuisance regulations and the requirement of installation permits. Reduction of emissions by process change including dry cleaning and pressurized dyeing has been popular because economic benefit has been realized. All recently installed exhaust control devices have been of the high-efficiency liquid scrubbing type. Incineration is generally considered the most efficient method, although industry finds the cost too high. (Author abstract modified)

36556 **APTIC NO. 60236**

Okuno, T., M. Tsuji, Y. Shintani, and H. Watanabe

ON THE PYROLYSIS OF PCB. *(Enka bifeniru no netsu bunkai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):351, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

A combination of pyrolytic gas chromatography and mass spectrum was employed to study the thermal treatment of polychlorinated biphenyls (PCB), which generates secondary air pollutants. Pyrolysis of 2-chlorobiphenyl at 850 C resulted in the detection of benzene and chlorobenzene when column temperature was set at 40 C, but gave three more peaks corresponding to biphenyl, monochlorobiphenyl, and hydrocarbons at 185 C. In addition to the above five peaks, pyrolysis of 2,4,5 trichlorobiphenyl gave also peaks corresponding to another monochlorobiphenyl isomer, dichlorobiphenyl, trichlorobiphenyl, and other hydrocarbons. Oxidation-decomposition of biphenyl resulted in 100% benzene ring cleavage, and more than 98% of hydrocarbons were converted to carbon dioxide and moisture.

36557 **APTIC NO. 59430**

Pariel, J. M.

THE COMBUSTION OF FUEL-WATER EMULSIONS, AND THE INCINERATION OF INDUSTRIAL WASTE LIQUIDS AND SLUDGES. *(Combustion des emulsions fuel-eau et incineration des effluents industriels liquides et boueux). Text in French. Rev. Gen. Thermique (Paris), 12(142): 971-979, Oct. 1973. 4 refs.*

General possibilities and advantages of the combustion of fuel-water emissions, and of the incineration of emulsions of industrial waste liquids and sludges in emulsion with auxiliary fuel are described. Elf type emulsion burners for water-fuel oil emulsions are currently used in industrial processes, e.g., for lime kilns, refractory burning kilns, and melting furnaces. Water-fuel oil emulsion burners operate with reduced air excess coefficient, and reduce the nitrogen oxide emission by 15-50%, the sulfur trioxide formation by about 50%, the unburned solid formation by 90%, and the soot deposits by 95%. The incineration of industrial liquid wastes and sludges in special emulsion burners together with auxiliary fuel provides for practically complete combustion despite reduced reaction time (less than 1 sec) and reduced air excess coefficient (10%), and minimum fuel consumption due to a reaction temperature of 800-850 C. This incineration process is suitable for the destruction of solvent residues, bacteriologic effluents, cyanide baths, phenol effluents, oils and oil emulsions, flocculation and flotation sludges, black liquor from pulp and paper mills, acidic tars, and of different waste waters containing formaldehyde, alcohols, detergents, white spirit, paints, acetone, toluene, and other hydrocarbons. The sulfur dioxide and SO3 emissions from such incineration operations can be efficiently controlled by scrubbing with sodium hydroxide, slaked lime, or ammoniacal liquids. The nitrogen oxides formation even from waste liquids with high nitrogen contents is negligible. Chlorine and hydrochloric acid emissions can be controlled similarly to SO2 and SO3.

36558 **APTIC NO. 59734**

Parker, William R.

NATIONAL EMISSIONS DATA SYSTEM AREA SOURCE INVENTORY FOR THE STATE OF IOWA. *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1001, Task Order 2, EPA-450/3-74-004, 22p., Sept. 1, 1973. 9 refs.*

NTIS: PB 230937/AS

Procedures are detailed for the task of completing National Emission Data System forms for area source emissions in each county of the state of Iowa. Input data were obtained, insofar as possible, from appropriate state agencies and the state's Implementation Plan; where agency data were insufficient to complete the forms, entries were determined following procedures outlined in the NEDS Manual for area source coding. Emission estimates were recorded for particulates, sulfur dioxide, oxides of nitrogen, hydrocarbons, and carbon monoxide. Sulfur and ash content were recorded for various coals. It was assumed that no coke or process gas could be attributed to area sources. Emission contributors included industrial sources, nonindustrial sources such as open burning, and motor vehicles.

36559 **APTIC NO. 60283**

Raman, V., P. K. Yemmawar, S. K. Maira, N. S. Manthapurwar, and G. Ramkumar

AIR POLLUTION ASPECTS FROM FERTILISER MANUFACTURE. *Indian J. Environ. Health, 15(4):283-288, Oct. 1973.*

A review of the common pollutants generated by fertilizer manufacturing and their sources of emission is presented along with some emission data collected from field studies. Pollutants considered are: sulfur dioxide generated from sulfuric acid manufacture, steam generation, and process heaters and furnaces; nitrogen oxides generated from nitric acid production and acidulation (nitrophosphate); dusts generated from grinding and transport of raw materials, raw material storage, escape from drier outlet points, and prilling towers; ammonia generated from its synthesis by reacting hydrogen and nitrogen and in urea production; fluorides generated from phosphoric acid plants and complex fertilizer plants; and sulfur trioxide and acid mists generated from the manufacture of sulfuric acid. Results are presented from source sampling during a field visit to a fertilizer plant.

36560 **APTIC NO. 59724**

Roffman, A.

THE STATE OF THE ART OF SALTWATER COOLING TOWERS FOR STEAM ELECTRIC GENERATING PLANTS. *Westinghouse Electric Corp., Pittsburgh, Pa., Environmental Systems Dept., Atomic Energy Commission Contract AT(11-1)-2221, Rept. WASH 1244, UC-12, 435p., Feb. 1973. 202 refs.*

NTIS: WASH 1244

The state-of-the-art of saltwater cooling towers for steam electric power generating plants is reviewed in terms of the following: a comparison of design, thermal performance, and costs between saltwater and freshwater cooling towers; techniques for measuring drift rate and droplet size distributions; methods for predicting atmospheric dispersion and deposition of drift; and environmental impact. Standard techniques for drift rate and droplet size measurement under field condition do not exist, and salt dispersion and deposition prediction models are general in nature and do not account for some important localized factors such as terrain and other obstructions. Environmental effects of salt water cooling towers vary from case to case depending upon the sensitivity and diversity of local conditions. Environmental impact appears to be confined up to several hundreds of meters from the cooling tower, although effects on biota, bodies of fresh water, soil salinity, and structures are difficult to detect at levels of long-term average in coastal areas. Most of the impact predictions are based upon studies pertinent to the coastal environment, which may or may not be applicable for salt water cooling towers in other locations. No correlation between airborne salt concentrations or deposition rate and environmental effects is possible based on research studies thus far.

36561 **APTIC NO. 59626**

Saito, Keizo and Shigeru Yanagihara

THEORETICAL STUDY OF NITRIC OXIDE FORMATION IN SPARK IGNITION ENGINES -- SUPPLEMENT. *(Hibana tanka kikan ni okeru NO seisei no keisan (ho)). Kikai Gijutsu Kenkyusho Shoho (J. Mech. Eng. Lab.), 27(6):187-191, 1973.*

The theoretical prediction of nitric oxide formation in spark ignition engines was based on thermodynamics and chemical kinetics. A simple experiment on a small gasoline engine was used to confirm the theoretical results. In the reaction process, the sample gas of the combustion chamber was extracted through the electromagnetic gas sampling valve synchronized with the crank angle of the engine. The distances from the spark point to the gas sampling port were 7, 15, 22, and 30 mm, and the sampling timing was shifted from -20 deg to 60 deg of T.D.C. with respect to each distance. Sample gas was accumulated in bags and analyzed by nondispersive infrared spectrometry to measure nitric oxide, carbon monoxide, carbon dioxide, and hydrocarbon concentrations. The NO concentration varied with sampling timing and the distance from the spark point. When the distance was the shortest, 7 mm, the increase of NO began before T.D.C., and the maximum value reached about 3000 ppm at 10 deg A.T.D.C., which was followed by a decrease. As the distance increased, the increase of No started later, and the maximum value was lower. The experimental results conformed with theoretical predictions.

36562 **APTIC NO. 59983**

Saito, Takeshi

DISTRICT HEATING AND COOLING SYSTEM AND AIR POLLUTION CONTROL. *(Chiiki reidanbo to taiki osen boshi). Text in Japanese. Kuki Seijo (Clean Air-J. Japan. Air Cleaning Assoc., Tokyo), 11 (Supplement 1):48-58, Nov. 1973.*

Practically all aspects of a district heating/cooling system are discussed in detail. Advantages of such a centralized system include a substantial reduction of air pollution as well as fire hazards, more effective utilization of fuel and building space, and less installation and running cost. Disadvantages are greater prior investment, difficulty in predicting the future load requirement, low annual utilization rates due to the seasonally limited operation, and problem of fee collection. The prevailing climate in the district that predominantly affects the load requirement of the district heating/cooling plant is discussed, taking up comparisons of degrees/day, lowest temperature, temperature difference between the lowest and the standard (18 C), and theoretical load factors among various cities including Quebec, New York, Chicago, Copenhagen, London, Paris, Sapporo, Tokyo, and many others. The heating media such as steam warm water, hot water, low pressure hot water, medium pressure hot water, and high pressure hot water used in European countries and the U.S.A. are described in terms of the temperature, steam pressure, calorific output, and other operating details. Energy sources for such a heating/cooling plant include petroleum oils, thermal power plant emission heat, gas turbine emission heat, and refuse incineration. Reduction of air pollution in Sapporo City, Japan in 1971 is discussed by showing annual and seasonal concentrations of sulfur oxides for Sapporo, Kawasaki, and Tokyo, and all of Japan from 1964 to 1972. The SOx concentration which had remained around 0.05 ppm for the annual average and at a level between 0.07 and 0.08 ppm for the winter in Sapporo was reduced to 0.03 ppm and 0.05 ppm respectively.

36563 **APTIC NO. 59566**

Shannon, Larry J., Richard W. Gerstle, P. G. Gorman, and D. M. Epp, T. W. Devitt, and R. Amick

EMISSIONS CONTROL IN THE GRAIN AND FEED INDUSTRY. VOLUME I - ENGINEERING AND COST STUDY. *Midwest Research Inst., Kansas City, Mo., Office of Air Quality Planning and Standards Contract 68-02-0213, Rept. EPA-450/3-73-003a, 583p., Dec. 1973. 128 refs.*

Results are presented from a study of the technical and economic aspects of emissions control in the grain and feed industry. The main objective of the study was to provide an improved technical and economic basis which the Environmental Protection Agency could utilize to formulate new source performance standards and other guidelines for emission control in this industry. Industry structure and statistics, the nature and sources of emissions, technical problems associated with emission control, cost of dust control equipment, and the overall economic impact of air pollution control are among the major topics covered in the report. (Author summary modified)

36564 **APTIC NO. 59629**

Siegel, S. M., B. Z. Siegel, A. M. Eshleman, and K. Bachmann

GEOTHERMAL SOURCES AND DISTRIBUTION OF MERCURY IN HAWAII. *Environ. Biol. Med., vol. 2:81-89, 1973. 16 refs.*

Measurements were taken of mercury in the air, water, rain, soils, rocks, and biological materials from the islands of Hawaii, Maui, and Oahu. Some high values were found, probably due to geothermal sources rather than industrial sources. Present Hg levels reflect the atmospheric dispersal of gaseous and particulate Hg discharged by volcanoes on Hawaii and on all the islands in the Hawaiian Archipelago. Bioconcentration of Hg by plants and fungi also caused high Hg values. Relatively large amounts of Hg in the air samples from Honolulu warrant further study to determine possible effects on human health. Air Hg levels were 40.7 + or 1.3, 2.2 + or 1.0, and 33.5 + or - 7.4 during three different days at a site near the Sulfur Banks. Near other volcanoes, levels were 40.5, 0.73, and 35.3 + or 7.1. Particulate Hg in atmospheric samples was 21.1 + or 3.3 and 2.2 + or - 1.0 micrograms/cu m. The Hg deposition on surfaces of copper, silver, and gold was 377, 396, and 80 micrograms/sq m, respectively. Mercury levels in

Honolulu at a beach front were 0.06-1.41 micrograms/cu m. The grass in the parkland adjoining the beach front contained up to 500 ppb Hg. The sediments underlying shallow reef-enclosed waters of Honolulu yielded up to 200 ppb.

36565 **APTIC NO. 60226**

Suzue, Shunji and Wataru Imase

INVESTIGATION OF STACK GAS CONCENTRATION IN TOKUSHIMA PREFECTURE (NO. 1). *(Tokushima-ken ni okeru baien hasseigen chosa (No. 1)). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:75-80, May 1973.*

Tokushima Prefecture investigated the sources of soot, dust, and sulfur contents of heavy oil used in the five areas, Kamoshima, Naruto, Komatsushima, Anan, and Ishii, using the dust tube method for the soot and dust concentrations and the radio isotope method for the sulfur content of heavy oil. The investigation of soot and dust was made on ten heavy oil boilers, a coal boiler, two wood chip boilers, and an incinerator. Three of the boilers investigated were below the emission standard and all the boilers, except the coal and wood chip boilers, met the emission standard. The determination of the sulfur content of heavy oil used was made on 116 test samples, and only three of these test samples contained more than 3% sulfur. Most heavy oil used contained 1.50 to 1.99% of sulfur. This is because the emission standard was applied to all the area. Especially in the Anan area where more severe emission standards exist, nearly all heavy oil used contained less than 2.50% sulfur.

36566 **APTIC NO. 60118**

Tew, Alan

SOUTH AFRICA: COAL IN THE 70 S. *(Suedafrika: Die Kohle in den siebziger Jahren). Text in German. Glueckauf (Essen), 109(2): 139-144, Jan. 197*

The current and anticipated role of coal as an energy carrier in the world, and particularly in South Africa, is outlined with respect to environmental concerns. The advanced depletion of the world s petroleum resources, and the lag in the development of fast breeder reactors increasingly call for the mobilization of the vast coal resources. Oil simply may become too expensive to be burned. However, the combined coal output of the western worlds has shown a decline since 1965, while that of the eastern block rose by 19%. The future of coal mining and of coal sales in South Africa is highly promising because South African coals excel by their low sulfur content, thus being especially suitable for either low-pressure, or high-pressure gasification. Up to 90% of the total electricity generation in South Africa is currently based on coal, and no change in the share of coal before 1980 is anticipated.

36567 **APTIC NO. 59748**

Thayer, Scott D. and Kenneth Axetell, Jr.

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME I-SHOPPING CENTERS. (FINAL REPORT). *Geomet, Inc., Rockville, Md., Office of Air and Water Programs Contract 68-02-1094, Task Order 1, Environmental Protectio Agency-450/3-74-003-a, 72p., Aug. 1973. 10 refs.*

NTIS: PB 230388/AS

A general methodology is presented for interpreting parameters which characterize a complex source into descriptions of traffic behavior in and around the source. The methodology is implemented in quantitative fashion for regional shopping centers. Traffic behavior parameters of shopping centers, including peak trip generation rates and vehicle running times, are related to more readily available characteristics of shopping centers, including average trip generation rates and parking, exit, and entrance capacities. Such relationships are to be used to relate shopping center characteristics to air quality. (Author abstract modified)

36568 **APTIC NO. 59926**

Thayer, Scott D.

VEHICLE BEHAVIOR IN AND AROUND COMPLEX SOURCES AND RELATED COMPLEX SOURCE CHARACTERISTICS. VOLUME II - AIRPORTS. (FINAL REPORT). *Geomet, Inc., Rockville, Md., Office of Air and Water Programs Contract 68-02-1094, Task Order 1, Environmental Protection Agency-450/3-74-003-b, 71p., Aug. 1973. 10 refs.*

The general methodology for interpreting paraeters which characterize a complex source into descriptions of traffic behavior in and around the source is presented. The methodology is implemented in a broad quantitative fashion for one type of complex source, airports. The information generated, relating airport parameters to the associated traffic behavior, can be used to generate guidance for studying the impact of new airports on air quality. The development of a major new airport or of an addition to an existing airport represents an event of sufficient rarity and magnitude that it will inevitably require an extensive and intensive environmental imapact study of its own, including major concepts in land development. A significant part of this must be a detailed study of all emission sources associated with the airport, including vehicles. (Author abstract modified)

36569 **APTIC NO. 60008**

Ungureanu, C., V. Neatu, H. Theil, Fr. Neiss, N. Oancea, and H. Gutmayer

TEST EQUIPMENT FOR THE STUDY OF THE COMBUSTION OF SULFUROUS FUEL OILS IN CYCLONE FURNACES. *(Stand experimental pentru studiul arderii pacurilor sulfuroase in focare-ciclon). Text in Romanian. Energetica (Bucharest), 21(12):547-552, Dec. 1973. 8 refs.*

The combustion in cyclone furnaces of Iranian sulfurous fuel oil was compared to that of Rumanian fuel oil. The test equipment used is described in detail. The combustion of sulfurous Iranian fuel oil is possible in cyclone furnaces with low power with a very low air supply and Bacharach smoke indices from 0 to 1. Carbon monoxide and hydroxide are below the permitted limits. Due to the high temperatures and the low percentage of oxygen in the combustion gases, the conversion of sulfur dioxide to sulfur trioxide is low, which means that the risk of corrosion is small.

36570 **APTIC NO. 59243**

Westerberg, E. N. and N. C. Berg

AIR POLLUTION: ITS RELATION TO ENERGY PRODUCTION AND RECOVERY OPERATIONS IN PULP AND PAPER MILLS. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 633-645, 691-697. 68 refs. (May 7-11.)*

The relationship of air pollution to energy production and recovery operations in the pulp and paper mills of Finland is discussed. Air pollution problems are closely related to the energy generating systems. With increased emphasis on air p[illegible] abatement and with increasing fuel and power costs, th[illegible]ry is expected to continue its ecological leadership position by focusing attention to the energy aspects. Tables are included to show emissions from different fuels when generating 1 Gcal net heat in steam and the supply of energy demand and its relation to air pollution. The most sulfur dioxide pollution comes from production of newsprint, followed by sack paper, and bleached kraft pulp.

36571 **APTIC NO. 60019**

Wysocki, Helmut, Heinz C. Buescher, Heinz Kister, and Walter Schuerhoff

DEVELOPMENT AND TESTING OF A NEW SLAG GRANULATION AND DEHYDRATION SYSTEM WITH AUTOMATIC SAND LOADING. *(Entwicklung und Erprobung eines neuartigen Schlackengranulations- und -entwaessenungssystems mit automatischer Sandverladung). Text in German. Stahl Eisen (Duesseldorf), 93(26):1246-1250, Dec. 20, 1973. 4 refs.*

An industrial granulation plant has built incorporating a new system of dehydration and transport of slag sand for the granulation of slag at the blast furnace. The granulate obtained can be divided into three types: glassy granulate with grain size greater than 0.2 mm, sludge-forming granulate with grain size below 0.2 mm, and floating granulate. All three groups have the same chemical composition and density (2.4 g/cc). They differ in porosity and mineral composition. The glassy granulate makes up 95% of the total. The granulator and dehydration silos are equipped with exhaust hoods for drawing off the vapors via a stack. Hydrogen sulfide at the stack exit was 104 ppm. At distances of 60 and 100 m from the stack no H2S was detected.

36572 **APTIC NO. 59735**

Zoller, John M.

NATIONAL EMISSIONS DATA SYSTEM POINT SOURCE INVENTORY FOR THE STATE OF KANSAS. *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-1001, Task Order 2, EPA-450/3-74-007, 39p., Nov. 1973.*

NTIS: PB 230938/AS

An emission inventory, including stack data and control equipment data, was accomplished for each identified point source in the state of Kansas via National Emissions Data System forms. Agricultural operations, particularly grain elevators, comprised the largest group of sources in the State; other sources included rock crushers, petroleum refineries, and various manufacturing operations. The areas with the greatest concentration of point sources were the counties of Reno, Sedgwick, Shawnee, and Wyandotte. Emissions inventoried included: particulates, sulfur dioxide, oxides of nitrogen, hydrocarbons, and carbon monoxide. Data for the approximate distribution of activities at grain elevators and the efficiencies of various control systems are summarized in tabular form. Explanations for variations in completing the inventory forms are provided for various specific sources.

36573 **APTIC NO. 59494**

AIR POLLUTION AND ITS SOURCES. *(Die Luftverunreinigung und ihre Quellen). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:311-318, Dec. 1973.*

The sources of air pollution in Switzerland are surveyed. In Switzerland, regional and local air pollution is due to domestic heating and traffic, as well as to industry and trade. Domestic heating, for which fuel oil is mainly used, is responsible for sulfur dioxide and soot emissions. The SO2 levels measured in urban areas in winter are 5 to 10 times larger than those measured in summer. Unless adequate measures are taken, the domestic heating-generated air pollution will increase parallel to fuel consumption. Exhaust gases and gasoline vapors constitute the basic pollutants generated by automobiles. While evaporation losses have been minimized by positive crankcase ventilation, exhaust emissions, containing such pollutants as carbon monoxide, nitrogen oxides, unburned hydrocarbons, and lead compounds, continue to be a problem. Industrial firing equipment generates less soot but more SO2 than domestic heating equipment. Various gases, vapors, dusts, smoke, soot, and fluorides are the major specific industrial emissions. The respective shares of domestic heating, industries, and traffic in the generation of waste gases in Switzerland are 50%, 19%, and 23.5%.

36574 **APTIC NO. 59614**

Tokyo Metropolitan Government (Japan), Ota District

REPORT ON THE COMPREHENSIVE INSPECTION CONFERENCE OF THE OTA DISTRICT, TOKYO, ON POLLUTION PROBLEMS. *(Tokyo-to Ota-ku kogai-to mondai sotenken kaigi hokokusho). Text in Japanese. 344p., March 1973.*

The air pollution episodes in the Ota district of Tokyo are mainly complaints against localized soot, bad odor, and harmful gases. However, most of the inhabitants (77%) are keenly aware of air pollution problems which cannot be attributed to specific emission sources such as sulfur dioxide and photochemical smogs which affect wider areas. In 1968, the total sulfur dioxide emission in this district was 5900 tons, and the amount decreased to 66% or 3900 tons in 1970 because of the conversion of fuel oil to low sulfur oil. This decrease rate compares with 87% of 23 metropolitan districts and 91% of the total Tokyo index. As of Dec. 1971, there were 127,000 automobiles in the district (one car per 2.2 families), and the daily automotive emission of aldehyde was 0.8 tons; carbon monoxide, 453 tons; hydrocarbons, 35.3 tons; nitrogen dioxide, 24 tons; sulfur dioxide, 1.7 tons; organic acid (acetic acid), 0.8 tons; and particulates, 2.3 tons. Compared to the averages of the total Japan, CO was 254 times over; HC, 91 times over; NO2, 58 times over; SO2, 1.6 times over; and particulates, 28 times over. No other district had such a drastic increase of SO2 concentration between 1963 and 1969; by the electroconductivity measurement, the annual SO2 average increased from 0.045 ppm to almost 0.09 ppm in 1969; it dropped to 0.75 ppm in 1971, but the environmental standard is still over the regulation standard. As part of countermeasures, plans for removal of 20 foundries and 180 presses and other secondary metal processing plants are scheduled after 1974 in the six districts along the Tokyo-Yokohama industrial belt. The application of PPP (Polluter s Payment Principle) is not necessarily operative in this district where 90% of operations are small businesses with less than 30 workers. The district is planning a subsidiary and loan funds for mediam and small industries.

36575 **APTIC NO. 59727**

GCA Corp., Bedford, Mass., GCA Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS BY TITANIUM. (FINAL REPORT). *Office of Air Quality Planning and Standards Contract 68-02-0601, Program Element 2AE132, Rept. EPA-450/3-74-008, 40p., May 1973. 19 refs.*

NTIS: PB 229634/AS

A national inventory of the sources and emissions of the element titanium is presented, including an overall flow chart depicting the quantities of titanium moving from sources of mining and importation through all processing and reprocessing steps to ultimate use and final disposition. All major sources of titanium-containing emissions are identified and their titanium emissions into the atmosphere estimated. Major emission contributors among the titanium industry sources are: pigment production (4.6%); pigment consumption (5.1%); and beneficiation of ore (0.5%). Major inadvertent sources are: coal burning (82.6%); non-metallic minerals (3.4%); and incineration (3.0%). A regional breakdown of these sources and their emissions is also presented. A method is recommended for updating the results of the study every two years. (Author abstract modified)

36576 **APTIC NO. 59736**

GCA Corp., Bedford, Mass., Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS OF MAGNESIUM (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-9601,* *Program Element 2AE132, Environmental Protection Agency-450/3-74-010, 34p., May 1973. 27 refs.*

NTIS: PB 230387/AS

A national inventory of the sources and emissions of magnesium was conducted. The study included in the preparation of an overall material flow chart depicting the quantities of Mg moving from sources of mining and importation through all processing and reprocessing steps to ultimate use and final deposition. The largest source, 57%, of Mg emitted to the atmosphere is from the combustion of coal. Within the Mg and Mg-compounds industries, the largest source of emissions is the production of refractory materials, 10%. Mining, processing, and calcining of magnesite and dolomite account for 17% of all U. S. emissions. A regional breakdown of these sources and their emissions is included. The physical and chemical nature of the Mg-containing emissions was delineated to the extent that information was available, and a methodology is recommended for updating the results of the study every 2 yr. (Author abstract modified)

36577 **APTIC NO. 59737**

GCA Corp., Bedford, Mass., Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS OF SILVER. (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-0601, Program Element 2AE132, Environmental Protection Agency-450/3-74-011, 42p., May 1973. 32 refs.*

A national inventory of the sources and emissions of silver was conducted. The study included the preparation of an overall material flow chart depicting the quantities of Ag moving from sources of mining and importation through all processing and reprocessing steps to ultimate use and final disposition. The principal sources are the iron and steel industry 46%; cement industry 25.7%; combustion of coal and oil 13.6%; and incineration 5.6%. The principal emissions of Ag are believed to be elemental silver, with some simple sulfides, oxides, and halides. A regional breakdown of these sources and their emissions is included. The physical and chemical nature of the Ag-containing emissions was delineated to the extent that information is available, and a methodology is recommended for updating the results of the study every 2 yr. (Author abstract modified)

36578 **APTIC NO. 59738**

GCA Corp., Bedford, Mass., Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS OF CHROMIUM (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-0601, Program Element 2AE132, Environmental Protection Agency-450/3-74-012, 40p., May 1973. 34 refs.*

NTIS: PB 230034/AS

A national inventory of the sources and emissions of the element chromium was conducted. The study included the preparation of an overall material flow chart depicting the quantities of Cr moving from sources of mining and importation through all processing and reprocessing steps to ultimate use and final disposition. Just over 50% of Cr emissions are from ferrochromium production, 20% results from the production of refractory materials and Cr steels, and 20% results from processes outside the Cr industry including the combustion of coal and oil, and the production of cement. A regional breakdown of these sources and their emissions was made and shows that most of the emissions are in Ohio and vicinity. The physical and chemical nature of the Cr containing emissions was delineated to the extent that information was available, and a methodology is recommended for updating the results of the study every 2 yr. (Author abstract modified)

36579 **APTIC NO. 59739**

GCA Corp., Bedford, Mass., Technology Div.

NATIONAL EMISSIONS INVENTORY OF SOURCES AND EMISSIONS OF MOLYBDENUM (FINAL REPORT). *Office of Air and Water Programs Contract 68-02-0601, Program Element 2AE132, Environmental Protection Agency-450/3-74-009, 36p., May 1973. 19 refs.*

NTIS: PB 230035/AS

A national inventory of the sources and emissions of the element molybdenum was conducted. The study included the preparation of an overall material flow chart depicting the quantities of Mo moving from sources of mining and importation through all processing and reprocessing steps to ultimate use and final disposition. Two thirds of the estimated atmospheric emissions of Mo are not associated with the Mo industry, but result from the combustion of coal. In 1970 there was sufficient quantity of coal burned to produce about 610 tons of emitted Mo. Other sources producing a total of 29% of all emissions include the mining of ore, the production of ferromolybdenum, the production of steel containing Mo as an alloying ingredient, and the roasting of ore concentrate. A regional breakdown of these sources and their emissions is included. The physical and chemical nature of the Mo-containing emissions was delineated to the extent that information was available, and a methodology is recommended for updating the results of the study every 2 yr. (Author abstract modified)

36580 **APTIC NO. 59749**

Office of Air and Water Programs, Research Triangle Park, N. C. Office of Air Quality Planning and Standards and National Council of the Paper Industry for Air and Stream Improvement, Inc.

ATMOSPHERIC EMISSIONS FROM THE PULP AND PAPER MANUFACTURING INDUSTRY. *Environmental Protection Agency-450/1-73-002, 144p., Sept. 1973. 36 refs.*

The nature and quantities of the atmospheric emissions from chemical pulping operations, principally the kraft process, are described. Principal sources of information were a comprehensive questionnaire sent to all the pulp mills, special studies, other literature sources, and a field sampling program conducted by EPA. Control techniques are described and emission ranges reported for each of the operations involved in the chemical pulping processes: Kraft, sulfite, semi-chemical, and soda. The emissions are primarily particulates and odorous inorganic and organic sulfur compounds. (Author abstract modified)

36581 **APTIC NO. 59756**

PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio

INVESTIGATION OF FUGITIVE DUST-SOURCES, EMISSIONS AND CONTROL. *Environmental Protection Agency Contract 68-02-0044, Task Order 9, 155p., May 1973. 79 refs.*

Major sources of fugitive dust and their respective contributions to emission inventories of specific Air Quality Control Regions were identified and control methods were estimated. Fugitive dust emissions are much greater than particulate emissions from conventional point and area sources in each of the six Air Quality Control Regions. The relative importance of individual fugitive dust source categories varies considerably from one region to another. Agricultural emissions overshadow all other sources in two of the regions and are a large contributor in a third. These two regions contain some of the most intensively farmed land in the country. In the other four Air Quality Control Regions, unpaved roads are the largest source of particulates. Fugitive dust from construction is prominent in the three regions with large metropolitan areas. Phoenix-Tucson is the only area in which any other source category makes a substantial contribution of overall regional emissions. Tailing piles are the source of almost 22,000 tons/yr, or 3.4% of the total particulate emissions. Most of the fugitive dust controls found are applications of one of three basic techniquesn-watering, chemical stabilization, or reduction of surface wind speed across exposed sources. Other control mechanisms are paving and traffic control for unpaved roads. (Author summary modified)

36582 **APTIC NO. 59916**

OXYGEN CONSUMPTION. *(Sauerstoffverbrauch). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:343-346, Dec. 1973.*

The oxygen cycle in the nature is outlined, and possible effects of the intensified use of fossil fuels on the atmospheric oxygen budget and on human life are discussed. The oxygen cycle in the environment is balanced by the fact that the oxygen liberated by plants, and also by animal organisms having fed on plants, equals the amount of oxygen used up for the oxidation during decomposition. This natural oxygen balance is now set off by the intensified use of fossil fuels which use up the oxygen once liberated by the plants. The oxygen consumption for all combustion processes now amounts to 16,800,000,000 tons yearly, while the total oxygen reserve in the atmosphere is 1,200,000,000,000,000 tons, and only 0.2 to 0.4% of the total oxygen reserve would be used for the combustion of the entire fossil fuel resource of the world. This indicates that the decrease in the atmospheric oxygen concentration due to combustion processes is too low to effect the environment and the human organism. Strong local reduction in the oxygen concentrations due to centralized industrial activity is leveled off by rapid atmospheric exchange processes.

36583 **APTIC NO. 59921**

Goodyear Atomic Corp.

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASEOUS DIFFUSION PLANT. (FINAL REPORT). *Atomic Energy Commission, 33p., July 26, 1973. 8 refs.*

NTIS: ORO-725

A study was performed to assess the environmental effects of the construction and operation of a gaseous diffusion plant for separation of uranium isotopes. Radioactive contamination, both alpha and beta-gamma, was judged possible only as a result of accidental release or from cleaning of equipment that is removed from the cascade. Alpha radioactivity in air samples from four locations averaged from 0.4-0.5 times 10 to the minus 13 micro Ci/ml, while beta-gamma averaged from 4.0-4.4 times 10 to the minus 13 micro Ci/ml. Small quantities of hydrogen fluoride were present in both the hydrogen and fluorine streams; average concentrations of fluorine found in the ambient environment at the plant examined were less than 1 ppb. Average sulfur dioxide air samples taken at four locations ranged from 28-42 micrograms/cu M, while particulate matter emissions were about 0.17 lb/million Btu input. Emission rates for SO2 were slightly under 6 lbs/million Btu input and were in excess of the state (Ohio) standards. The use of lower than 3% sulfur fuel is expected to correct the situation.

36584 **APTIC NO. 59977**

Environment Agency and Osaka Prefectural Government (Japan)

REPORT OF 1972 AIRCRAFT EMISSION GAS SURVEY RESULTS. *(Showa 47 nendo kokuki haishutsu gasu chosa kekka hokokusho). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 25:95- 114, Oct. 1973. 7 refs.*

Carbon monoxide, nitric oxide, hydrocarbons, sulfur oxides, aldehydes, and total dusts plus their chemical compositions were measured in aircraft engine exhausts at different engine operating cycles. Sampling and analytical methods are described. Emissions of CO, total hydrocarbons, and aldehydes decrease with higher engine rpm, while SOx and NO increase. The total dust measurement was 300 micrograms/cu m with 80% engine revolutions and 500 with 95% for one engine, and they were 1900 with 56%, 3900 with 83%, and 5900 with 90% for another engine tested.

36585 **APTIC NO. 60302**

Bureau of Mines, Bartlesville, Okla., Fuels Combustion Research Group

ALDEHYDE AND REACTIVE ORGANIC EMISSIONS FROM MOTOR VEHICLES. PART II CHARACTERIZATION OF EMISSIONS FROM 1970 THROUGH 1973 MODEL VEHICLES. (FINAL REPORT). *Office of Air and Water Programs Interagency Agreement MSPCP-IAG-001, APTD-1568b, 48p., March 1973. 2 refs.*

NTIS: PB 224252/AS

Motor vehicle aldehyde, reactive organic emissions, carbon monoxide, and nitrogen oxides were measured from 1970 through 1973 model automobiles. Carbon monoxide emission from the 10 vehicles tested ranged from 11 to 60 g/mi when using a 40% aromatic fuel. Hydrocarbon emissions from the 10 vehicles ranges from 1.8 to 5.9 b/mi when a 40% aromatic fuel was used. Oxides of nitrogen emissions ranged from 1.9 to 9.4 g/mi with a 40% aromatic fuel. Aldehyde emissions were from 0.07 to 0.3 g/mi by the MBTH method and 28% higher by the DNPH method. With a 22% aromatic fuel, CO was 13% higher, NOx emissions were 8.7% lower, and there was no change for hydrocarbons. For the 1970-1973 production vehicles, molar hydrocarbon reactivity for exhaust from the 40% aromatic fuel averaged about 3% higher than that for the 22% fuel. The molar hydrocarbon reactivity of exhaust from thermal reactor and oxidation catalyst vehicles was about 25% lower than that for the 1970-1973 production vehicles. The molar hydrocarbon reactivity of exahust from the dual catalyst vehicle was about 50% lower than that for thermal reactor and oxidation catalyst vehicles. (Author summary modified)

1972

36586 **APTIC NO. 59262**

Barsdate, Robert J. and Richard C. Dugdale

EFFECTS OF VOLCANIC ASHFALLS ON CHEMICAL AND SEDIMENT CHARACTERISTICS OF TWO ALASKAN LAKES. *J. Fish. Res. Bd. Can., vol. 29:229-236, 1972. 16 refs.*

Cores from two lakes on Afognak Island, 150 km southeast of the Aleutian volcanic arc, indicated that several ashfalls have formed continuous layers over the lake basins, at least partially returning the lakes to a juvenile state with respect to their sediments. Abundant diatom remains were found in the sediments above each ash layer. During several hundred years after each ashfall, the transition to mature conditions followed a pattern characterized by decreasing diatom abundance and gradual increases in organic matter and clay-size inorganic particulates. High silica concentrations occurred in lakes within the area covered by the ashfall of the 1912 Mount Katmai eruption. (Author abstract)

36587 **APTIC NO. 59726**

Christianson, Alden G.

POLLUTIONAL ASPECTS OF GEOTHERMAL RESOURCES DEVELOPMENT. *Preprint, Environmental Protection Agency, Corvallis, Oreg., National Thermal Pollution Research Program, 8p., March 1972. 3 refs.*

Resource potential and pollution aspects of geothermal energy development are reviewed. Only two areas (both in California) among the vast acreages in the west having geothermal potential have been explored extensively. A geothermal steam power station has been developed at the Geysers area in Northern California and has an installed capacity of 192 MW; projections are for 600 MW by 1975 and around 1000 MW by 1980. The Geysers field in California is one of only two dry steam fields known to exist, and its geothermal steam needs only to be filtered for removal of abrasive particles before being passed through a turbine for power generation. Cooling towers are a necessity for geothermal power production, and hence the possibilities of fogging and other meteorological effects will require evaluation. Noxious gases, notably hydrogen sulfide, are also capable of release as by-products from geothermal wells; and, although the percentage of steam comprised of such gases is very low and variable, the absolute amounts of undesirable constituents may be excessive. Hydrogen sulfide, for example, may be released from geothermal power plants in amounts exceeding those from fossil plants burning high sulfur fuel, though technology is available for preventing such release.

36588 **APTIC NO. 59537**

Crawford, Lloyd W., Arthur A. Mason, and James M. Lents, Jr.

POLLUTION PRODUCTION IN A SIMULATED TURBOJET AFTERBURNER. PART II: COMPUTER PROGRAM FOR CALCULATION OF POLLUTANT HISTORY IN AFTERBURNING TURBOJET ENGINES. (FINAL REPORT). *Tennessee Univ., Tullahoma, Space Inst. Air Force Aero Propulsion Lab. Contract F33615-71-C-1125, Proj. 3066, Task 306605, AFAPL-TR-71-66 Part II, 75p., Feb. 1972.*

NTIS, DDC: AD 739177

An experimental and theoretical study was made of the history of the pollutants carbon monoxide, unburned hydrocarbons, and nitrogen oxides in a turbojet afterburner. Experimental traverses at several axial stations were performed in a simulated afterburner in which exhaust from a J-47 combustor can, operated at medium power, was mixed with fuel spray. Experiments were carried out both in a nonbypass and in a bypass configuration (secondary air was mixed with primary exhaust). The nonbypass tests was carried out at a high combustor efficiency, and yielded the following: 300 ppm CO, less than 10 ppm HC, and 100 ppm NOx. In the bypass tests, fuel distribution was nonuniform and combustor efficiency was low. The concentrations obtained were 10,000 ppm CO, 1000 ppm HC, and 100 ppm NOx. The theoretical analysis consisted of a computer program for reacting flow with turbulent mixing. The computer program was very slow and therefore of limited usefulness in terms of cost and questionable results, since it could not be checked against experimental data. Infrared measurements of nitric oxide in the combustion tunnel were attempted. Indications were obtained of NO at the 5.3 micron band, but quantitative measurements were not obtained. (Author abstract)

36589 **APTIC NO. 59576**

Dugger, G. L., A. Brandt, J. F. George, L. L. Perini, D. W. Rabenhorst, T. R. Small, and R. O. Weiss

HEAT-ENGINE/MECHANICAL-ENERGY-STORAGE HYBRID PROPULSION SYSTEMS FOR VEHICLES. FINAL REPORT. *Johns Hopkins Univ., Silver Spring, Md., Applied Physics Lab., Office of Air Programs Contract NOOO-17-62-C-0604, Rept. APTD-1344, Rept. CP 011, 324p., March 1972. 163 refs.*

NTIS: PB 213035

An analytical study indicated that a flywheel-only propulsion system could satisfy specified performance requirements for a city bus, and that flywheel/heat engine hybrids could meet the specified requirements for cars, vans, and busses. In all cases substantial emission-free ranges could be achieved with hybrid systems by using the engine only periodically (at constant load) to recharge a large, high-energy flywheel. Experiments verified the prinicple of the superflywheel by spin tests of unidirectional materials in rod or bar rotor configurations. The better results demonstrated energy densities greater than 30 W-h/lb (maximum of 48) for boron filaments and slender rods of graphite and glass composites. High-speed photographs of rotor failure showed complete pulverization of 1-pound rods in 0.6 ms as they impacted steel contaminant rings; only 1 to 2% of the initial stored energy was imparted to the rings. Thus, composite flywheels will be much easier to contain than metal flywheels and are promising candidates for energy storage devices. Emissions of hydrocarbons, nitrogen oxides, and carbon monoxide were studied for combinations of flywheel and spark ignition engines, gas turbines, diesel engines and steam engines. (Author abstract modified)

36590 **APTIC NO. 59462**

Grobman, Jack

REVIEW OF JET ENGINE EMISSIONS. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68064, 17p., 1972. 15 refs. (Presented at the Department of Transportation Survey Conference: Climatic Impact Assessment Program, Cambridge, Mass., Feb. 15-16, 1972.)*

NTIS: N72-24830

A review is given of the emission characteristics of jet engines. The sources and concentrations of the various constituents in the engine exhaust and the influence of engine operating conditions and cycles on emissions are discussed. Cruise emissions from supersonic engines are compared with emissions from subsonic engines. The basic operating principles of the gas turbine combustor are reviewed with the effects of combustor operating conditions on emissions. The performance criteria that determine the design of gas turbine combustors are discussed. Combustor design techniques are considered that may be used to reduce emissions. Engine exhausts include the unreacted constituents in air, the products of complete combustion, the products of incomplete combustion (carbon monoxide and hydrocarbons), nitrogen oxides, and constituents due to trace elements in the fuel. Nitric oxide appears to be the only pollutant that is formed during high altitude cruise that has significant concentration. (Author abstract modified)

36591 **APTIC NO. 60140**

Oelert, Henning H. and Th. Florian

DETERMINATION AND EVALUATION OF ODOR NUISANCES DUE TO DIESEL ENGINE EXHAUST GASES. *(Erfassung und Bewertung der Geruchsbelaestigung durch Abgase von Dieselmotoren). Text in German. Staub, Reinhaltung Luft, 32(10):400-407, Oct. 1972. 45 refs.*

The odor nuisances due to diesel engine exhaust were estimated by a three-person test panel, and malodorous components in diesel exhaust were determined analytically. Persons with constant ratio of the acrolein and 1-pentene odor threshold values were selected for the panel tests. In this manner, it was possible to evaluate the intensities of diesel exhaust in comparison with test components by dimensionless numbers. The odor intensity of the exhaust increased with increased engine load and decreased with increasing engine speed. The odor intensity was lowest at idle. The engine load had a stronger influence on the odor intensity than the engine speed did. Aliphatic olefins including acetylene with 1 to 6 carbon atoms, hydrocarbons with more than 6 carbon atoms, and aliphatic aldehydes were chiefly responsible for the exhaust odor, while acrolein played a subordinated role. The odor intensity of diesel engine exhaust gases can be reduced by means of catalytic afterburners with a minimum efficiency of 90%.

36592 **APTIC NO. 59449**

Ohman, Howard L., John Viletto, Jr., Kenneth T. Anderson, and L. LeForest Miller

POTENTIAL SAND AND DUST SOURCE AREAS. (REPORT NO. 1 OF STUDIES OF THE ARMY AVIATION V/STOL ENVIRONMENT). *Army Engineer Topographic*

Labs., Fort Belvoir, Va., Geographic Sciences Lab. and Agriculture Dept., Soil Conservation Service, Reimbursable Service RO 72-10, Rept. ETL-SR-72-1, 14p., Aug. 1972. 10 refs.

NTIS, DDC: AD 749462

World patterns of various soil types that have a potential for generating atmospheric sand and dust through natural causes or man-induced mechanical agitation are discussed. Three maps are used to show soil types as determined by classes of particle size, seasonal durations of wet, moist, and dry soil conditions, and the distribution of siliceous, vitreous, saline, and acidic soils, soils with high percentages of iron and aluminum, and soils consisting largely of montmorillonitic clays. The maps provide the basis for a realistic assessment of Army aircraft design problems which can be attributed to sand and dust. Additionally, they contribute to the total store of environmental information needed to determined the environmental criteria to be adopted in the design and testing of Army V/STOL aircraft. Soil texture, size, particle shape, moisture, and chemical and physical properties are reviewed. (Author summary modified)

36593 **APTIC NO. 60308**

Platt, Melvin and E. Karl Bastress

THE IMPACT OF AIRCRAFT EMISSIONS UPON AIR QUALITY. *Society of Automotive Engineers, New York, Soc. Automotive Engrs. Int. Conf. Transp. Environ., Proc., Washington, D. C., 1972, p. 1902-1911. 8 refs. (May 31-June 2, Paper 720610.)*

Aircraft emissions and their impact upon air quality were studied at four major air carrier airpots and two general aviation airports. Predicted concentrations of non-methane hydrocarbons and carbon monoxide, due to aircraft emissions alone, exceeded their respective national ambient air quality standards. Aircraft emissions also contributed significantly to excessive concentrations of nitrogen dioxide. Aircraft contributions to particulate and sulfur dioxide concentrations, on the other hand, appeared small in areas where the public has reasonable access. There were no instances in which predicted concentrations exceeded air quality standards in the case of general aviation airports. Lead concentrations were found to approach but not exceed potentially harmful levels in certain areas which did not meet the reasonable access requirement. Future projections of uncontrolled emissions through 1980 indicated that NO2 emissions will rise sharply while HC emissions will drop significantly. Carbon monoxide concentrations in 1980 may exceed the air quality standard, and Pb concentrations may exceed the level associated with increases in blood Pb-levels. Preliminary estimates of emission control effectiveness for various control methods indicate that large reductions in concentrations of CO, total HC, NOx, and particulates due to the emissions of turbine-engine aircraft can be achieved as can reductions in CO, total HC, and Pb emissions from piston-engine aircraft utilizing control devices developed for automobile engines. (Author abstract modified)

36594 **APTIC NO. 59504**

Ranzieri, Andrew J.

AIR QUALITY MANUAL. ANALYSIS OF AMBIENT AIR QUALITY FOR HIGHWAY PROJECTS. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S-5-72-13, 11p., July 1972. 22 refs.*

A California Division of Highways air quality manual on analysis of ambient air quality for highway projects has been prepared as part of a program designed to train district personnel in assembling air quality reports. Topics covered include: air pollution control districts in California; problems in using existing fixed location air quality data for a distant highway location; ambient air quality data to be obtained from existing stations; sampling procedures for on-site ambient air quality surveys; statistical analysis of ambient air data; mesoscale analysis of ambient air quality data (transported air pollution, time history of number of adverse days, pollutant burden concept); and prediction of future pollutant concentrations. Appendices covering air quality data for California and statistical analysis of ambient air quality are also provided.

36595 **APTIC NO. 59506**

Shirley, Earl C.

AIR QUALITY MANUAL. TRAFFIC INFORMATION REQUIREMENTS FOR ESTIMATES OF HIGHWAY IMPACT ON AIR QUALITY. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S(3)- 72-09, 34p., April 1972. 11 refs.*

A California Division of Highways air quality manual on traffic information requirements for estimates of highway impact on air quality has been prepared as part of a program designed to train district personnel to assemble air quality reports. Topics covered include: vehicle operating mode and pollutant emissions (hydrocarbons, carbon monoxide, and nitric oxide); vehicle volumes; traffic network changes; traffic growth factors; time framework for estimates; traffic parameters and environmental effects (mesoscale and microscale); and minimum traffic estimate requirements.

36596 **APTIC NO. 59497**

Westfield, William T.

ESTIMATION OF ENGINE EMISSIONS AT ALTITUDE THROUGH GROUND TESTING. *Society of Automotive Engineers, Washington, D. C., Soc. Automotive Engrs. Int. Conf. Transp. Environ., Proc., Washington, D. C., 1972, p. 86-93. 1 ref. (May 31-June 2, Paper 720612.)*

An afterburning turbofan engine was operated over a range of simulated altitudes and Mach numbers to determine if a correlation existed between static sea level emissions of carbon monoxide, total unburned hydrocarbons, oxides of nitrogen, and particulate matter and those at altitudes and flight speeds. Data were taken at a point about 27 ft downstream of the exhaust nozzle exist and on the centerline of flow. No apparent effect of altitude or flight speed on emissions, either gaseous or particulate, was observed. Total HC resulting from operation in the low power range of any one afterburning zone were higher than the total HC emissions resulting from operation in the higher power region of the same afterburning zone; NOx did not readily reveal any separate trends associated with the individual zones of afterburning. Nonafterburning modes gave a larger number of particles per grid; and, as the level of afterburning was increased, the number of particles decreased. Carbon monoxide emission levels decreased as the level of power within each zone was increased. (Author abstract modified)

36597 **APTIC NO. 59255**

New South Wales, Australia, Air Pollution Advisory Committee

TENTH ANNUAL REPORT OF THE AIR POLLUTION ADVISORY COMMITTEE. *Rept. 68, 23p., Oct. 1972.*

Recent amendments to the Clean Air Act and licensing and regulatory activities of the Air Pollution Advisory Committee are reported. Developments in air pollution control programs in the ceramics, chemical, coke, primary metallurgical, gas, grinding and milling, oil refining, scrap metal recovery, cement, premix bitumen, and ferrous and non-ferrous metal industries, as well as boilers, incinerators, furnaces, railways, and petroleum storage depots are reviewed. The problem of motor vehicle emission control is discussed. Results of air pollution monitoring for smoke, dust, sulfur dioxide, carbon monoxide, and total oxidants, and stack surveillance of particulate matter and chemical composition of stack emissions are presented. Vegetation damage from air pollution, the imput to a telephone complaint service, and the development of a new instrument for measuring ozone are reported.

36598 **APTIC NO. 59773**

Ministry of Labor, Health, and Welfare of North Rhine-Westphalia (West Germany)

CONCEPT OF CLEAN AIR MAINTENANCE IN NORTH RHINE-WESTPHALIA. *(Konzept der Luftreinhaltung in Nordrhein-Westfalen). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit? Ein Konzept fuer das Nordrhein-Westfalen bis 1980. p. 13-14, 1972.*

The concept of clean air maintenance and the principal tasks of industry in this area in North Rhine-Westphalia during the period ending 1980 are outlined. The clean air maintenance program is based upon a set of experiences gained during the last decade in the area of air pollution control. Harmonization of the technological advancement with the requirements of environmental protection constitutes the basic task of the industry in all its activities. Industries emit a multitude of air pollutants, and new processes and new products will entail emission of even more pollutants, especially in the chemical industry. Soot, fly ash, coke, cement, iron oxide and carbide dusts, sulfur dioxide, hydrogen sulfide, nitrogen oxides, chlorine, hydrochloric acid, fluorides, hydrofluoric acid, carbon monoxide, hydrocarbons, phenols, lead, arsenic, asbestos, cadmium, beryllium, mercury, manganese, mercaptans, copper, zinc, butyric acid, dimethylformamide, and formaldehyde rate among the best-known industrial emissions.

36599 **APTIC NO. 59775**

Ministry of Labor, Health, and Welfare of North Rhine-Westphalia (West Germany)

IRON AND MALLEABLE-IRON FOUNDRIES. *(Eisen- und Tempergiessereien). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit? Ein Konzept fuer das Nordrhein-Westfalen bis 1980. p. 38-40, 1972.*

The state of the art and the expected evolution until 1980 of the dust, sulfur dioxide, and gaseous fluoride emissions from iron and malleable-iron foundries in North Rhine-Westphalia are outlined. By reducing the specific dust emission from melting furnaces from 1.5 kg to 1.0 kg/ton of Fe, and by the introduction of total dust separation, covering the entire melting process, the yearly dust emission is expected to decline from 8400 tons to 5000 tons. The SO2 emission, now 4800 tons/yr at a specific emission of 1.6 kg/ton of Fe, is expected to decline by 33% due to the reduction in the coke consumption, and to the anticipated increase in the use of natural gas, and electric melting furnaces. The gaseous F emission from basic and nonbasic furnaces, 100 tons in 1969, is expected to fall to 10 tons in 1980 due to the abandonment of furnaces with basic linings.

1971

36600 **APTIC NO. 60334**

Beslier, J.

ELECTRICAL VEHICLES WITH FUEL CELLS: WHY AND HOW? *North Atlantic Treaty Organization, Committee on the Challenges of Modern Society, Proc. Conference on Low Pollution Power Systems Development, Eindhoven, Netherlands, 1971, Chapt. 16, p. XVI-1-XVI-12. (Feb. 23-25.)*

GPO

Considerations involved in the development of an electric vehicle powered by a fuel cell source are reviewed. Vehicle weight safety demands and performance requirements consistent with modern traffic patterns appear to necessitate the development of a vehicle having medium sized dimensions, a generator with large energy capacity, and a fuel cell. The methanol-air fuel cell, currently being researched by Peugeot-Alsthom in combination with Esso-USA, appears to be a relatively easily obtained fuel, with an acceptable cost, which can be distributed by existing service stations with no new infrastructure. A nonpolluting generator and a silent motor transmission unit are other requirements in electric vehicle development currently being investigated.

36601 **APTIC NO. 59446**

Ducsik, Dennis W., Paul Mertens, and George Neill

OFFSHORE SITING OF ELECTRIC POWER PLANTS. *In: Power, Pollution, and Public Policy - Issues in Electric Power Production, Shoreline Recreation, and Air and Water Pollution Facing New England and the Nation. Massachusetts Inst. of Technology, Cambridge, Mass., Sea Grant Project Office, NOAA Contract GH-88, Mit Rept. 24 Rept. NOAA-72022912-2, p. 29-87, June 1971. 79 refs.*

NTIS: COM-72-10398

The siting of electric power stations for the New England coastal area at offshore locations was investigated in terms of the technical, economic, and legal feasibility of the concept and its potential for the effective resolution of land use conflicts while having extremely attractive features in the areas of environmental protection and public safety. The concept has a high degree of economic feasibility. Electric power costs to industry in the New England Coastal Area might be reduced to a level competitive with the national average; concurrently, inland and shoreline air and water pollution problems associated with power production might be eliminated. The concept is technically feasible with only minor extensions of current engineering capabilities and is adaptable to nuclear, fossil fuel, and magnetohydrodynamic generating plants.

36602 **APTIC NO. 59932**

Hurn, R. W.

THE PROBLEM OF DIESEL ENGINE EXHAUST IN UNDERGROUND MINES. *Univ. of Missouri, Rolla, Dept. of Mining, Petroleum, and Geological Engineering, Proc. Conf. Underground Mining Environ., Rolla, Mo., 1971, p. 241-250. (Oct. 27-29.)*

The operation of diesel engines in underground areas requires careful attention to space ventilation to keep concentrations of toxic products to acceptable limits. These requirements and the basis for calculating them are reviewed. Diesel engines need 50-75 cfm ventilation air/hp to reduce toxic products in exhausts to acceptable limits. A special hazard is the case of an engine rebreathing its own exhaust as a result of inadequate ventilation. This results in progressively accelerated carbon monoxide discharge with possibilities for very rapid development of extremely hazardous CO levels in the vicinity of an inadequately ventilated engine. Overall, the problem of maintaining safe atmospheres is lessened as the amounts of toxic pollutants from engines are reduced. Methods to reduce engine exhausts which contain nitrogen oxides, CO, hydrocarbons, smoke, and odor include limiting power, exhaust gas recirculation, water injection, engine design modification, and catalytic control. Recirculation effectively controls NOx, catalytic conversion controls CO.

1970

36603 **APTIC NO. 59565**

Ingold, C. T.

MECHANISMS OF LIBERATION OF SPORES AND POLLEN. *Komission zur Erforschung der Luftverunreinigung, Kolloq. Allerg. Pollen Sporen, Darmstadt, West Germany, 1970, p. 7-24. 13 refs. (April 14.)*

The mechanism of spores and pollen liberation and dispersal are described. For effective dispersal, liberation should be somewhat above ground level. The pollen of wind-pollinated trees, especially conifers and catkin-bearing trees, is usually liberated between 1 and 50 m above the ground. Grasses and nettles liberate pollen at 0.1-1.0 m. The positioning of spore production in relation to spore-liberation, mechanisms of discharge in various plants, and the mechanism of violent discharge in ascospores and ballistospores are discussed.

36604 **APTIC NO. 59535**

Williams, F. W. and J. E. Johnson

ATMOSPHERIC CONTAMINATION WITH A CLEANING SOLVENT. *In: Progress Report--Chemical Research in Nuclear Submarine Atmosphere Purification. Naval Research Lab., Washington, D. C., Rept. 7037, p. 6-10, June 2, 1970. 9 refs.*

NTIS: AD 709896

Cleaning with Freon-113 (1,1,2-trichloro-1,2,2-trifluoroethane) is all-metal systems should be highly efficient as long as there is adequate means of removing the cleaning solvent and residual vapors. Based on experiences with several nuclear submarines, three nitrogen purges and evacuations at the termination of the cleaning procedure of high-pressure systems seem adequate to remove the Freon-113. However, the number of purges and evacuations required could vary with the system configuration and local conditions, particularly ambient temperature. Thus, the system should always be checked following the cleaning procedure to make sure it is free of Freon-113. For the most part, Freon-113 is not compatible with synthetic materials, and its compatibility in any nonmetallic system should be ascertained before using it in such a system. The cleaning solvent should not be emptied into the submarine indiscriminately. The use of Freon-113 for cleaning diver's hoses and other breathing equipment must be carefully monitored to show the absence of residual solvent. The level of Freon-113 in nuclear submarine atmospheres under closed boat conditions should not exceed 10 ppm based on the corrosion limits set for other compounds containing three chlorine atoms.

1969

36605 **APTIC NO. 59914**

Douglass, Irwin B., Moh-Lian Kee, Roger L. Weichmann, and Lawrence Price

SOURCES OF ODOR IN THE KRAFT PROCESS. III. ODOR FORMATION IN BLACK LIQUOR MULTIPLE-EFFECT EVAPORATORS. *TAPPI, 52(9):1738-1741, Sept. 1969. 8 refs.*

Experiments on sources of odor in the Kraft process were conducted with black liquor multiple-effect evaporators. Much of the methyl mercaptan found in the vapor and condensate from the evaporation of unoxidized black liquor was formed at an earlier stage in the process and was present in the black liquor (0.219 g/gal or 438 g/ton pulp) as it entered the evaporator. Very little dimethyl sulfide was found. Some methyl mercaptan was formed during the evaporation of unoxidized black liquor, though the total amount was uncertain and appeared to be less than the amount dissolved in the entering dilute liquor. Oxidation of black liquor prior to evaporation decreased the amount of methyl mercaptan which was formed during evaporation. The concentration of sulfide ions in the black liquor may have increased during evaporation through some kind of a reversion reaction. Little or no dimethyl sulfide was formed in the multiple-effect evaporator due to the relatively short residence time of liquor in each effect.

36606 **APTIC NO. 59261**

McCarthy, J. H., Jr., W. W. Vaughn, R. E. Learned, and J. L. Meuschke

MERCURY IN SOIL GAS AND AIR-A POTENTIAL TOOL IN MINERAL EXPLORATION. *Geol. Surv. Circ., no. 609: 1-17, 1969. 7 refs.*

GPO

The mercury content in soil gas and in the atmosphere was measured in several mining districts to test the possibility that the Hg content in the atmosphere is higher over ore deposits than over barren ground. At Cortez, Nev., the distribution of anomolous amounts of Hg in the air collected at ground level (soil gas) correlates well with the distribution of gold-bearing rocks that are covered by as much as 100 ft of gravel. The Hg content in the atmosphere collected at an altitude of 200 ft by an aircraft was 20 times background over a Hg deposit and 10 times background over two porphyry copper deposits. Measurement of Hg in soil gas and air may prove to be a valuable exploration tool. (Author abstract)

1968

36607 **APTIC NO. 59781**

De Groot, R. C.

DIURNAL CYCLES OF AIRBORNE SPORES PRODUCED BY FOREST FUNGI. *Phytopathology, 58(9):1223-1229, Sept. 1968. 19 refs.*

A sampling program for low-level airborne fungus spores was conducted in a cutover, mixed hardwood-conifer forest on the western periphery of the Adirondack mountains. Populations of small spores, presumably mostly basidiospores that would be produced within the forest community, exhibited diurnal cycles with nocturnal peaks. The population of the small spores was greater below the canopy of a spruce stand than above it. The diurnal cycles of these spores were characterized by day-to-day variations in rate of increase from mid-day minimum to nocturnal peak but generally had relatively uniform nocturnal populations after the maximum concentration was attained. Dosage levels of the spores above the forest canopy were direction-oriented due to the combined effect of diurnal cycles in spore populations and of diurnal cycles in wind direction. (Author abstract modified)

36608 **APTIC NO. 59559**

Holt, Charles S., Alan J. Hoffman, and Clyde B. Morita

AIR POLLUTANT EMISSION SURVEY FOR THE BOSTON STANDARD METROPOLITAN STATISTICAL AREA. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., Office of Air Programs Rept. APTD-0879, 47p., Aug. 1968. 7 refs.*

An air pollutant emission survey of the Boston Standard Metropolitan Statistical Area (SMSA) was conducted in June 1968 to catalog the total quantities of five pollutants; carbon monoxide, hydrocarbons, sulfur oxides, nitrogen oxides, and particulates. Points and areas in the Boston SMSA were defined by the use of a grid system based on the Massachusetts State Plane Coordinate System. For distribution by grid, emissions were calculated by town or city and assumed to be equally distributed over the geographical area of the political jurisdiction. The total emissions for a jurisdiction were then multiplied by the percentages of town or city in each grid and a figure for each grid was estimated. Four source categories were considered: transportation, solid waste, stationary sources, and process emission. The results are presented in 16 tables, including the mean daily, seasonal, and average variation of pollutant emissions by grids. Gasoline combustion accounted for 90% of the CO emissions and 85% of the HC emissions. The largest emitters of SOx were power plants and stationary sources; power plants were also the largest single source of particulate emissions. The highest contributor to the NOx total was the combustion of gasoline and diesel fuel.

1963

36609 **APTIC NO. 59232**

Edson, Murray H.

THE INFLUENCE OF COMPRESSION RATIO AND DISSOCIATION ON IDEAL OTTO CYCLE ENGINE THERMAL EFFICIENCY. *Society of Automotive Engineers, Inc., New York, Digital Calc. Engine Cycl., Proc., 1963 (?), p. 49-64. 34 refs.*

The ideal Otto cycle engine is theoretically analyzed to examine the influence of the compression ratio and dissociation on engine thermal efficiency over an extreme range of compression ratios (4-300) to see if chemical dissociation could limit Otto cycle engine thermal efficiency. Assuming isooctane, benzene, ethyl alcohol, and nitromethane to be the fuels being consumed, the effects of compression ratio and mixture strength on the thermodynamic properties and equilibrium species concentration of the working fluid at every step in the ideal Otto cycle were computed. The calculations were made using a mathematical model of the ideal adiabatic engine programmed to an IBM 704 digital computer. The effect of compression on engine thermal efficiency was calculated over a wide range of operating conditions. The engine thermal efficiency continued to increase with compression ratio at least up to 300:1 for all fuels considered. The effect of compression ratio and mixture strength on chemical dissociation was studied using the parameters extent of dissociation and net energy loss. The first was the deviation from the theoretical concentration of product species when a given fuel/air mixture is burned. The net energy loss associated with chemical dissociation was defined as the change in internal energy between a burned mixture at chemical equilibrium and the frozen theoretical burned mixture when both are at some selected temperature and pressure level. Both dissociation parameters were examined after combustion at top dead center in the Otto cycle engine at various levels of compression ratio and mixture strength. The extent of dissociaton and net energy loss increased with increasing compression ratio. The increase was small. Under theoretical and ideal conditions, there was no upper limit to which the compression ratio of the Otto cycle engine can be raised. Any increase in chemical dissociation brought about by increasing temperature is substantially suppressed by the very rapidly increasing pressure levels which result when the compression ratio is increased. (Author abstract modified)

CONTROL METHODS

1974

36610 **APTIC NO. 60268**

Amaya, Norio

COMBUSTION AT POWER PLANT BOILER AND NITROGEN OXIDES CONTROL. *(Hatsudensho boira no nensho to chisso sankabutsu taisaku). Text in Japanese. Boira Gishi (Boilermen), 29(1):1-9, Jan. 1974.*

The concentration of nitrogen oxides present in boiler exhausts depends upon design factors (such as type of boiler and method of combustion) and operating conditions (such as load, amount of excess air, and fuel used). Thus measures to reduce NOx must be tailored to each specific case. At the Kansai Electric Power Co. measures have already been taken to lower emissions to below the standard of 230 ppm. Further measures will be completed by the summer of 1974. The measures include two-stage combustion, stack gas mixing combustion, a combination of the two, and the improvement of the burners. These measures were also adopted in newly installed boilers in addition to lowering the temperature of combustion air, increasing the furnace cooling area for reduction of combustion temperature, and improving the burners to lower the flame temperature.

36611 **APTIC NO. 60251**

Arase, Takeshi

NITRIC OXIDE CONTROL FOR INDUSTRIAL BOILER. *(Jikahatsu sangyoyo boira NOx taisaku ni tsuite). Text in Japanese. Kami Pa Gikyoshi (J. Japan Tech. Assoc. Pulp. Paper Ind.), 28(4):143-155, April 1974.*

The formation mechanism of nitrogen oxides and NOx control measures are discussed. Nitrogen in air reacts with oxygen at an extremely high temperature to form NOx. The reaction velocity and equilibrium state change with temperature, the equilibrium concentration of nitric oxide being 1.2% at 2000 C and 5.3% at 3000 C. The reaction velocity is also faster with higher temperatures. Nitric oxide is oxidized to form nitrogen dioxide. The complex mechanism of NOx formation in a boiler is explained by using the Zeldovich Mode and the expanded Zeldovich Model. Nitrogen oxides emissions of a boiler or furnace can be controlled by improving the combustion method. Nitrogen oxides-related improvements of combustion method can be made at the level of fuel, excess air ratio, damper opening, exhaust gas recirculation, combustion air temperature, burner angle, and boiler or furnace load. The Nox control systems that should be considered when installing a new boiler are described. They include a tangential corner firing system, an over-fire air system, a bias combustion system, larger furnace, recirculation, and a combustion system with low-temperature air. General procedures for remodeling an existing boiler for reduction of NOx emission are presented step by step. Also listed are the NOx removal devices or processes introduced by various industrial firms, most of which involve catalytic reduction.

36612 **APTIC NO. 59872**

Batel, Wihlelm

THE DUST COLLECTING SCRUBBER - PRESENT STATE OF DEVELOPMENT AND FUTURE TRENDS. II. *(Der Waschenstauber - Entwicklungsstand und- tendenzen. Teil II). Text in German. Staub, Reinhaltung Luft, 34(2):52-55, Feb. 1974. 46 refs.*

The total dust collection efficiency of a scrubber is obtained from the degree of dust removal on the scrubbing stage and from the degree of droplet separation. The droplet separator must therefore be well adjusted to the scrubber. For droplet separation, usually centrifugal separators, deflection separators, or filters are used. The operating principles of these three main kinds of droplet separators, and the calculation of the collection efficiency, are briefly reviewed. Apart from dust, gaseous pollutants can be removed with scrubbers. With a soda solution for instance, the sulfur dioxide collection effiency is 85%. Other gaseous pollutants such as phosphorus, chlorine, and fluorine can be separated with scrubbers as well.

36613 **APTIC NO. 59385**

Bauerle, George L., Lee L. C. Sorensen, and Ken Nobe

NITRIC OXIDE REDUCTION ON COPPER-NICKEL CATALYSTS. *Ind. Eng. Chem. Prod. Res. Develop., 13(1):61-64, March 1974. 10 refs.*

Catalytic activity for the reduction of nitric oxide with carbon monoxide on copper-nickel catalysts of varying composition has been investigated. The catalysts were prepared by impregnating preformed alumina pellets with aqueous solutions of Cu and Ni nitrates, calcining at 500 deg and activating in CO at 350 deg. Catalytic activity is dependent on the Ni:Cu ratio. In general, activity increased with increasing Cu content. Above 60 atom % Cu (carrier-free basis), which corresponds to filled 3d band vacancies of Ni, the reduction activity did not vary substantially with catalyst composition. At the higher Cu levels, the reaction is first order with respect to NO; reaction order decreased with decreasing Cu content below 24%. More severe activation of the catalysts in CO at 500 deg led to the opposite trend in activity; that is, activity increased with an increase in Ni content. Furthermore, a general decrease in the relative level of activity occurred with catalysts reduced at 500 deg. (Author abstract)

36614 **APTIC NO. 60293**

Bauerle, George L., J. David Pinkerton, and Ken Nobe

MIXED OXIDE CATALYSTS FOR POLLUTION CONTROL. *Atmos Environ., 8(3):217-219, March 1974. 1 ref.*

The following mixed oxide catalysts were investigated for automobile exhaust control: lanthanum rhodium oxide(LaRhO3), strontium ruthenium oxide(SrRuO3), strontium yttrium(0.5) ruthenium(0.5) oxide(2.75) (SrY(O.5)Ru(O.5)O(2.75)), lathanum nickel(0.5) ruthenium(0.5) oxide(LaNi(O.5)Ru(O.5)O3), and nickel oxide chromate(NiOCr2O3) spinel. For auto exhausts, LaRhO3 had the equivalent oxidation activity as platinum; SrRuO3 and SrY(O.5)Ru(O.5)O(2.75) were superior for nitric oxide reduction and low ammonia formation. (Author abstract modified)

36615 **APTIC NO. 60113**

Benarie, M. and D. Bodin

SIMPLE METHOD FOR THE PREPARATION OF STANDARD GAS DILUTIONS IN THE MICROGRAMS/CU M TO MG/CU M RANGE. *(Methode simple pour la preparation de dilutions de gaz etalon dans le domaine du micrograms/cu m au mg/cu m). Text in French. Atmos. Environ., 8(2):193-196, Feb. 1974. 7 refs.*

A simple device for producing standard diluted gas mixtures, in which the constant flow rate is maintained by the gas viscosity, is described. A small pressure difference is derived from a frictionless mercury ring piston. The device is composed of a gas space with the frictionless mercury ring piston producing constant pressure difference, a graduated thermometer capillary, and a mixing system. The device represents a volumetric primary standard. At the same time, it is also a secondary standard, as the flow rate is known by reference to well-known constants, such as gas viscosity, cubic dilatation coefficient of the mercury, mass, and length measurements. The apparatus is distinguished by its very simple construction and its relative insensitivity to temperature variations. Analytical verifications with sulfur dioxide and nitrogen dioxide revealed concentration variations not greater than 1%.

36616 **APTIC NO. 59220**

Bendixen, T. W. and G. L. Huffman

IMPACT OF ENVIRONMENTAL CONTROL TECHNOLOGIES ON THE ENERGY CRISIS. *In: News of Environmental Research in Cincinnati. Environmental Protection Agency, Cincinnati, Ohio, National Environmental Research Center. 8p., Jan. 11, 1974. 12 refs.*

The impact of environmental control technologies on the energy crisis is examined. Four major environmental control practices exemplify the magnitude of the impact on energy demand: emission control for automobiles; sulfur dioxide control for power plants; municipal wastewater treatment; and solid waste collection and disposal. The energy required to operate the last three control processes would be only 1.04% of today s total demand for the United States, assuming that all of the Nation s power plants have SO2 scrubbers, all municipal solid waste is properly collected and landfilled, and all municipal wastewaters are treated to the tertiary level. The 10% average loss in fuel economy due to first-generation control devices required for emission control for automobiles should very nearly be recouped in the 1975 model year; engine modifications compatible with the new catalytic converter emission control devices should make this possible. (Author summary modified)

36617 **APTIC NO. 59329**

Bickelhaupt, Roy E.

ELECTRICAL VOLUME CONDUCTION IN FLY ASH. *J. Air Polluton Control Assoc., 24(3):251-255, March 1974. 14 refs.*

Resistivity and unsophisticated transference experiments were conducted at temperatures above 200 C. Six commercially produced fly ashes having similar overall chemistry but differing significantly in concentrations of alkali metals and alkaline earths were used. Test specimens were fabricated by pressing and sintering the ash into self-supporting discs. An Arrhenius equation was used to interpret the resistivity-temperature relationship. From the lack of deviation in experimental activation energy among the ashes the same conduction mechanism prevailing in each was shown. The quantity of electricity conducted was proportional to a mass transfer and lithium and sodium ions migrated. Resistivity was inversely proportional to the combined Li and Na concentration. The volume conduction process was controlled by an ionic mechanism in which Li and Na are the principal charge carriers. The overall conduction process involving specimens and electrodes was interpreted using the results of recent fundamental research on silicate glasses. (Author abstract)

36618 **APTIC NO. 60123**

Boehlen, Bruno

AIR POLLUTION PREVENTION IN THE INDUSTRY: A SEGMENT OF ENVIRONMENTAL PROTECTION. *(Immissionsschutz in der Industrie - eine Teilaufgabe des Umweltschutzes). Text in German. Seifen- Oele-Fette-Wachse, 100(5):113-118, 130-131, March 1974.*

General problems of air pollution control in industries are discussed. No further increase of the pollutant emissions and ground level pollution levels should be permitted, and all advanced technical and technological means should be exploited to reduce harmful emissions; a combined measure was implemented in Switzerland. Abatement of pollutant emissions by technological and engineering improvements, waste gas cleaning, and, as a temporary solution, waste gas dilution by means of high stacks, are the basic approaches to the problem of pollution control. Different types of wet separators, such as adsorbers, scrubbers, cyclones, electrostatic precipitators, and tissue filters, are suitable for the separation of particulate matter and gases in specific grain size ranges which also influence their efficiency. Single-stage wet type separators are usually unsuitable for the simultaneous removal of gases and aerosols. Absorber columns, bubblers, whirling chambers, venturi scrubbers, and spray towers are among the equipment commonly used for the separation of gaseous pollutants. Malodorous components can be removed by adsorption and thermal or catalytic incineration.

36619 **APTIC NO. 59893**

Brocke, W. and P. Davids

INTERNATIONAL STATE-OF-THE-ART OF WASTE GAS DESULFURIZATION IN POWER PLANTS. *(Internationaler Stand der Technik der Abgasentschwefelung in Kraftwerken). Text in German. Brennstoff- Waerme-Kraft, 26(3):102-108, March 1974. 29 refs.*

At the end of 1973, more than 50 coal- and oil-fired power plants the world over operated or built facilities for desulfurization of the waste gases. All plants operated or under construction in the United States are listed in a table. In a second table the desulfurization plants in Sweden and Japan are listed. All major desulfurization processes in use today are reviewed and operating experiences with existing plants are discussed. Scrubbing with calcium carbonate or oxide has achieved the most advanced state of development and is or will be used soon in 23 power plants, of which four facilities have a capacity of more than 1000 MW. The desulfurization plant in Ohmuta, Japan, which uses this method has been in operation for 1 yr and achieves a collection efficiency of more than 90%. The Bahco plant in Stockholm has operated since 1969 without difficulties with a similar high collection efficiency. The sulfite/sulfate run off with the scrubbing fluid is, in many cases, separated. In Japan, gypsum is obtained from it. In the U. S., the sludge is deposited. With methods using a water/fly dust suspension for desulfurization, little is known yet about operating experiences. Scrubbing with sodium compounds has been successfully used in the desulfurization plant in Chiba since 1971. Six plants operate according to this method to date. Scrubbing with magnesium compounds still poses unsolved problems in the dryer and the regeneration stage. Adsorption on activated coal proved to be very expensive compared to the wet processes. A catalytic desulfurization process is applied in a coal-fired power plant. A collection efficiency of more than 85% has been achieved with it. The method has been in operation for a very short time only. A discussion of the approximate costs of the various methods is given.

36620 **APTIC NO. 60164**

Brus, P., M. Gravestijn, and C. Prins

THERMAL AFTERBURNING. PRACTICAL SOLUTION TO A WASTE GAS PROBLEM. *(Thermische naverbranding. Praktische oplossing voor een afvalgasproblem). Text in Dutch. (Polytech. Tijdschr., Ed. Procestechniek (The Hague)), 29(2):35-40, Jan. 1974.*

Processes and equipment for the thermal afterburning of malodorous waste gases from the drying of Novilon, a vinyl-based floor-covering material, at NLF Krommenie BV in the Netherlands are described. The gases to be treated contain solvent vapors, plasticizers, stabilizers, and foaming agents. The waste gases are burned with a gaseous fuel at 750 C; the hold time in the combustion chamber is 0.5 sec. Since the waste gas to be incinerated contains about 19% oxygen, no secondary air is necessary. The waste heat from the combustion chamber is utilized for the heat-up of the raw gas and from steam generation. The hydrocarbon, carbon monoxide, and nitrogen oxide concentrations in the burned waste gas are 3 ppm, 584 ppm, and 26 ppm, against the respective initial concentrations of about 800 ppm, 98 ppm, and 26 ppm.

36621 **APTIC NO. 59599**

Campbell, K. and G. Onion

FILTER EXHAUST SYSTEMS FOR THE REDUCTION OF LEAD EMISSIONS FROM PETROL ENGINES. *Filtration Separation (Purley), 11(1):42-47, Jan./Feb. 1974. 7 refs. (Presented at the Filtration Society s Conference on What s New in Dust Control and Air Cleaning at the Dust Control and Air Cleaning Exhibition, London, England, Sept. 25-27, 1973.)*

The development of alumina-coated steel wool filters for the reduction of lead in exhaust gases of gasoline-powered motor vehicles is reviewed along with information on the construction and performance of pleated glass fiber filters. Filling the resonator and silencer boxes with alumina-coated steel has successfully reduced Pb emissions on a wide range of vehicle models. Tests run on vehicle dynamometers which simulated typical commuter-type driving indicated that Pb emissions were reduced to between 13 and 34%, depending upon the vehicle model; no attempt was made to optimize filter design. The mechanisms of Pb deposition appear to include either singularly or in combination the processes of filtration, adsorption, and condensation; while Pb retention seems to be a result of normal contact forces, irreversible adsorption, and chemical combination, either in concert or singularly. Glass fiber filters of the pleated type with cylindrical elements also appear to have potential for reducing lead emissions, especially when preceded by the alumina coated filter. The filters also appear effective in reducing the total particulate emissions, reductions being of similar magnitude to those for Pb.

36622 **APTIC NO. 59314**

Cheng, L., J. E. Emmerling, and T. F. Tomb

COLLECTION OF AIRBORNE COAL DUST BY STEAM. *Pittsburgh Mining and Safety Research Center and Pittsburgh Field Health Group, Pa., Bureau of Mines Rept. of Investigations 7819, 17p., 1974. 13 refs.*

Laboratory investigations of the effectiveness of low-pressure steam and a steam-water spray sequence for the collection of airborne respirable (less than 10 micron) coal dust were performed. Comparison of the results with those from previous investigations employing water spray alone indicated that the use of steam in a steam-spray sequence increased the collection efficiency by about 14% over that obtained by water spray alone. The use of steam, however, does not appear to be an attractive approach for collecting airborne dust in underground coal mining operations since it requires the cooling of the steam-dust mixture in order to achieve condensation of the steam. (Author abstract modified)

36623 **APTIC NO. 59845**

Davids, P.

THE AIR POLLUTION PROBLEM HAS A SOLUTION. *(Das Luftreinhalteproblem ist loesbar). Text in German. Umwelt (Duesseldorf), 4(1):26-27, 1974. 4 refs.*

Measurements of the emissions from communal incinerators in the Federal Republic of Germany show that 3.9 kg hydrogen chloride kg trash, 0.033 hydrogen fluoride, 3.3 kg sulfur dioxide and 1.3 kg nitrogen oxides per ton of trash are emitted on the average. The contribution of incinerators to the total pollution is relatively low. Incinerators pose mainly a local pollution problem which can be rather easily solved because of the relatively high concentration of the pollutants in the waste gas. High collection efficiencies can be achieved with simple technical facilities. The removal of HCl and HF from waste gases is successfully applied in a number of processes. Even behind incinerators, scrubbers have been successfully used. Although these scrubbers have been primarily used for dust collection, every expert knows that simultaneously a high collection efficiency for HCl and HF is achieved. Calculations of the investment and operating costs of scrubbers are given.

36624 **APTIC NO. 59674**

Dazai, Saburo, Kiyoshi Sugita, Yoshiaki Miura, and Kinichi Sugawara

FINE ORE SINTERING METHOD DESIGNED TO MAKE DISPOSAL OF ITS EXHAUST GAS EASIER. *(Haigasu shori o yoi narashimeru funkoseki shoketsuho). Text in Japanese. (Nippon Steel Corp., Tokyo (Japan)) Japan. Pat. Sho 49-1681. 5p., Jan. 16, 1974. 1 ref. (Appl. Sept. 18, 1969, 2 claims).*

This invention pertains to the disposal of sulfur dioxide emitted from sintering. The relative concentration of sulfur dioxide is higher for the wind boxes closer to the end of the sintering process if the ore contains about 0.05% sulfur. The peak SO2 concentration moves closer toward the firing side with higher sulfur content. The SO2 concentration of the gas emitted from a given wind box will fluctuate with the quality of the ore, thus making it necessary to measure the concentration at each wind box and dispose of the gas when the concentration is over the specified level, requiring complex and costly equipment. Since the point of the peak SO2 concentration moves due to accumulation of SO2 retained in the sintered layers of the material and subsequent discharge of the SO2 as the process progresses, this new measure has been devised so that the peak point is reached at predetermined wind boxes. This is achieved when the materials to be sintered form two layers on the moving bed, the upper layer consisting of lower sulfur content material and the lower layer of higher sulfur content. The material is treated with slaked lime to increase its SO2 retention power.

36625 **APTIC NO. 60163**

Fink, F.

ELECTROTHERMAL GASIFICATION OF TRASH. *(Elektrothermische Vergasung von Hausmuell). Text in German. Umschau Wiss. Tech., 74(2):56-57, 1974.*

Trash, which usually has a composition of 27% moisture, 51% combustible matter, 14% ash and 8% metal, dries rapidly at 1500 to 1700 C. The combustible matter dissociates to carbonaceous material and low-temperature gas. Since both products react with the water vapor present, trash gas is obtained which consists mainly of carbon monoxide and hydrogen. Upon exist from the furnace the trash gas has a temperature of 1600 C and must be cooled and scrubbed. The gas contains hydrogen chloride and alkali vapors which are neutralized by the scrubbing process. The heating value of the cleaned waste gas is about 3000 kcal/cu m. The gas can be used for production of a number of useful organic compounds, or, added to the city gas, it can be used for power and steam generation. In favorable cases, plants for the pyrolysis of trash produce the power for their own consumption from trash gas, or sell ferrometals and steam for heating.

36626 **APTIC NO. 59607**

Frauenfelder, A.

OVERCOMING SPECIAL PROBLEMS IN ELECTRICAL PRECIPITATION. *Filtration Separation (Purley), 11(1):52, 54, 56, Jan./Feb., 1974. (Presented at the Proceedings of the Filtration Society, Filtration Society s Conference on What s New in Dust Control and Air Cleaning at the Dust Control and Air Cleaning Exhibition, London, England. Sept. 25-27, 1973.)*

Problems encountered with the operation of electrostatic precipitators are reviewed in relation to the pretreatment of gases, the flow of gases in the precipitator, corrosion, and stress corrosion. Very dry gases and dust with high electrical resistivity require pretreatment such as water injection for favorable recovery. Normally, gas conditioning towers with water nozzles are provided ahead of the precipitator in order to cool the gases to 150-200 C and to raise the water dew point of the gases to 50-55 C. Other conditioning agents such as sulfur trioxide are employed for thermal power station applications. Even distribution of the dust-laden gases over the whole area of the precipitator is of the utmost importance. Model tests are essential if expensive adjustments of the full scale precipitator are to be avoided. Modern precipitator design must also ensure that gases will not bypass the electrical fields. Precipitators are susceptible to corrosion, particularly in the cement industry; thus, the shell of the precipitator is normally built in concrete and the works in acid-resisting materials. Rubber coating is used on the inside of precipitators designed for aluminum finishing processes employing the treatment of aluminum with chlorine gases. Stress corrosion is another problem, and for precipitators sited behind raw mills in cement works where temperatures are rather low, protection by a varnish might be helpful. Other design considerations include a good high tension rectifier, unbreakable discharge electrodes, and optimum plate gap width.

36627 **APTIC NO. 59685**

Fukui, Saburo, Shinjiro Suzuki, and Korehiko Nishimoto

DESULFURIZATION METHOD OF WASTE GAS FROM SINTERING FURNACE. *(Shoketsuro haigasu no datsuryu hoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-1361. 5p., Jan. 12, 1974. (Appl. July 31, 1968, 1 claim).*

This invention offers a new flow system for the waste gas in a sintering furnace, thereby greatly reducing the quantity of waste gas generated during the sintering process. Installation and running costs of desulfurization equipment for disposal of the gas may be reduced. It features a circulation system in which the waste gas produced in the earlier stages of the sintering process is fed into the next stages as combustion air or gas. The waste gas produced is led into the chemical disposal device provided outside in which the gas, now enriched in sulfur dioxide and sulfur trioxide, is desulfurized. Fresh air is supplied to the final section of the furnace where the sintering process will be completed. The waste gas produced in this section is led into the discharge duct and mixed with that already treated by the chemical disposal device. This raises the temperature of the waste gas to be discharged through a stack, thereby helping effective atmospheric diffusion of the gas. The use of the same waste gas three times concentrates the sulfur oxides of the gas approximately threefold while greatly reducing the gas quantity.

36628 **APTIC NO. 59306**

Fuller, Martin J. and Malcolm E. Warwick

LOW-TEMPERATURE CATALYTIC REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE ON SNO2-CUO GELS. *Chem. Commun., no. 2:57-1974. 5 refs.*

The low-temperature catalytic reduction of nitric oxide by carbon monoxide on tin oxide-copper oxide gels was investigated with a view to automobile exhaust purification. After thermal activation at 450 deg, coprecipitated SnO2-CuO gels, particularly those having a Cu:Sn atomic ratio of between 0-5.1 and 0-6:1, show high activity and high selectivity for nitrogen formation at low temperature (150 deg) in the catalytic reduction of NO with CO compared with a commercial barium-promoted copper chromite catalyst. (Author summary modified)

36629 **APTIC NO. 59387**

Halstead, M. P., D. B. Pye, and C. P. Quinn

LAMINAR BURNING VELOCITIES AND WEAK FLAMMABILITY LIMITS UNDER ENGINE-LIKE CONDITIONS. *Combustion Flame, 22(1):89-97, Feb. 1974. 12 refs.*

Laminar burning velocities and weak flammability limits have been measured at high temperatures and pressures achieved simultaneously by the use of an adiabatic compression machine. For methane the measured burning velocity compares well with extrapolations from less severe conditions. For the other hydrocarbon fuels such a comparison was not possible but the relative values of the burning velocities mirror those for flames burning in air at atmospheric pressure and room temperature. For methane, 2-methylpentane, methylcyclopentane, hex-1-ene, and toluene the weak flammability limits were all found to be close to the half-stoichiometric mixture, as at atmospheric pressure and ambient temperature. In contrast, for hydrogen and ethylene the weak limits are at stoichiometries of 0.13 and 0.35. For three gasolines of widely different composition, the weak limits were all found to be near to an air-to-fuel ratio (W/W) of 30, which is substantially leaner than the practical operating limit in gasoline engines of current design. Emission of pollutants is reduced by burning a very weak air-fuel mixture and control equipment, such as afterburners, may be avoided. (Author abstract modified)

36630 **APTIC NO. 59670**

Hama, Akira

BAG FILTER. *(Baggu firuta). Text in Japanese. (Kurimoto Iron Works, Ltd., Osaka (Japan)) Japan. Pat. Sho 49-10027. 4p., March 7, 1974. (Appl. Sept. 9, 1968, 1 claim).*

A bag filter designed for more effective utilization of the inner space capacity of the filter tank which achieves higher dust removal efficiency with a smaller bag filter is presented. The pressure air feed system is designed to effectively remove the dust deposited on each filter unit of the device. A number of smaller bag filters are placed in a radial arrangement in two or more rows. These filter units are suspended from the horizontal partition wall which divides the interior of the device into two sections, the upper section being a clean air compartment and the lower a filtration compartment. The gas to be treated is taken into the filtration compartment through the intake duct which is formed to produce a tangential flow of the gas. Pressurized air to clean the filter units is fed through an L shaped air intake duct which rotates in the clean air compartment. All the filter bags are cleaned with two turns of the L-shaped air duct.

36631 **APTIC NO. 59848**

Henne, Hans

PAST, PRESENT, AND FUTURE OF ENVIRONMENTAL PROTECTION IN THE POTASH INDUSTRY. *(Umweltschutz und Kaliindustrie: gestern, heute und morgen). Text in German. Kali Steinsalz, 6(7):227-234, Jan. 1974.*

The state of the art and future perspectives of environmental protection, primarily in the water and air pollution prevention areas, in the potash industry in West Germany are outlined. Salt dusts from mills, material handling equipment, and dryers, and waste gases from dryers and power plants are the basic emissions in the potash industry. The maximum allowable dust concentration of 150 mg/cu may have to be revised because the dust emissions are in the form of water-soluble salts. Multicyclones are increasingly being abandoned in favor of high-efficiency dust separators for dryers. Gaseous emissions, including sulfur dioxide emissions, are reduced as more and more plant switch from coal-firing to fuel oil and natural gas.

36632 **APTIC NO. 60007**

Hiramatsu, Tsuyoshi and Yoshiaki Togame

REDUCTION EFFECT OF NITROGEN OXIDES BY IMPROVEMENT OF BURNER TIP. *(Banachippu kaizo ni yoru sankachisso no teigen koka). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(4):39-42, April 1974.*

Experiments on the reduction of nitrogen oxides at an electric power station have shown that improvement of the burner tip alone without improving the body of the boiler raises the rate of reduction. Four different arrangements of spray holes for the burner tips were used in the investigation. The use of three improved burner tips reduced the concentration of NOx to about 60 to 90 ppm. In some burner tips this was due to the lowering of oxygen concentration and in others because of the cooling effect of air to which the flame is subjected. Thus, a combination of improvement of the burner tip and lowering of combustion air temperature can reduce NOx to 160-180 ppm.

36633 **APTIC NO. 59867**

Hofmann, W. M.

MOISTURE RETENTION BY AEROSOL FILTERS. *(Feuchtigkeitsaufnahme von Schwebstoffiltern). Text in German. Heizung Lueftung Haustech., 25(3):77-78, March 1974. 3 refs.*

Practice has shown that high relative humidities of air flows passing through various types of aerosol filters cause high pressure losses before any higher quantity of aerosols is retained. For a closer investigation of the problem, the moisture retention by the filter material was measured on three used and two new aerosols filters. Aerosol filters should not be passed by air flows with a relative humidity of more than 80% because of the higher moisture retention by the filter. The hydrophobic filter material dose very little to prevent this due to the filter structure and to dust depositions.

36634 **APTIC NO. 60255**

Horikoshi, Takehisa

FLUE GAS DESULFURIZATION FACILITIES FOR SMALL BOILERS AND A GAS WASHING EQUIPMENT. *(Kogata boirayo haien datsuryu sochi to mezarato gasu senjo sochi). Text in Japanese. Boira Gishi (Boilermen), 29(1):10-15, Jan. 1974.*

The stack gas desulfurization facilities for small boilers, developed by Ebara Manufacturing Co., are described. Sulfur dioxide produced by the burning of heavy oil is dissolved in caustic soda to form sodium sulfite, which is, in turn, converted into sodium sulfate by special oxidation equipment and the caustic soda absorption liquid recycled. The facilities are characterized by high efficiency, low pressure loss, low power consumption, simplicity and compactness of design, easy maintenance, good adaptability to variation in gas volume, and the prevention of white smoke by a white smoke remover. Also described is the Ebara mesh plate tower gas washing facility designed to remove fluorine gas and dust from aluminum electrolysis factories.

36635 **APTIC NO. 59783**

Hosono, Hiroo, Jiro Moritsugu, Mikio Yamaoka, and Toshio Katagiri

ELECTROSTATIC PRECIPITATOR. *(Denki shujinki). Text in Japanese. (Matsushita Electric Industrial Co., Ltd., Kadoma (Japan)) Japan. Pat. Sho 49-4434. 3p., Jan. 31, 1974. 3 refs. (Appl. Dec. 24, 1965, 1 claim).*

This is an improved version of an electrostatic precipitator air cleaner featuring reduced size and noise as compared with the conventional air cleaner. It features a vertical fan driven by a vertical motor. Both the fan and its drive motor were installed horizontally within the conventional EP air cleaner. Another new feature is that the former swivel chamber wind tunnel in which the fan and motor are housed is now replaced by a newly designed wind tunnel, the lower half of which is an inverted cone and the upper half a narrower discharge duct. The new wind tunnel structure is made of foam styrol. The upright position of the fan and motor helps reduce the size of the whole air cleaner while the foam styrol wind tunnel absorbs the noise generated by the fan.

36636 **APTIC NO. 60133**

Huber, Eugen W. and Nikolaus Simon

EXHAUST GAS IMPROVEMENT AT OTTO ENGINES THROUGH TWO-STAGE COMBUSTION. *(Abgasverbesserung bei Ottomotoren durch zweistufige Verbrennung). Text in German. (Motortech. Z. (Stuttgart), 35(1):4-8, 1974. 8 refs.*

Through division of the combustion chamber into a turbulence chamber and a main combustion chamber with different fuel-to-air ratios in the two chambers above the piston, a two-step combustion is achieved. Combustion is initiated in the fuel rich first chamber where there is a lack of free oxygen. Hardly any oxides of nitrogen can form. The developing carbon monoxide and hydrocarbon fractions are burned in the second chamber where a high air surplus is maintained. Based on the results of experiments with a single-cylinder research engine with 614 cu cm piston displacement, the improvements of the exhaust gas emissions over conventional combustion processes are discussed. The considerably lower dependence of the emissions on the air ratio in divided combustion was remarkable. The cyclic fluctuations of the pressure characteristics during divided combustion are much lower than in conventional combustion. The uniformity is comparable to that of diesel engines. Operation with a lambda of 1.84 at which the highest emissions occur, produced only half as much nitrogen oxides and hydrocarbons than with conventional combustion.

36637 **APTIC NO. 60214**

Hull, Andrew P.

COMPARING EFFLUENT RELEASES FROM NUCLEAR AND FOSSIL-FUELED POWER PLANTS. *Nucl. News, 17(5):51-55, April 1974. 21 refs.*

The effluents from nuclear and fossil-fueled power plants are compared for harm and emission standards. Nuclear boiling water reactors will release 1.66 times 10 to the 6th power gaseous airborne effluents, 5.31 airborne halogens and particulates, 49.6 liquid fission and corrosion products, and 104 Ci/yr liquid tritium effluents. Pressurized water reactors will release 9650, 0.17, 30.2, and 5720 Ci/yr, respectively. Nuclear plants will also emit radioactivity. Coal, oil, and gas fueled power plants emit sulfur dioxide, nitrogen dioxide, carbon monoxide, hydrocarbons, and particulates. If fossil-fueled and nuclear power plants are compared by their compliance with standards, and if air quality standards are given the same significance that the radiation protection standards have been given, then nuclear plants clearly limit over-all air pollution to a greater degree than fossil-fueled plants.

36638 **APTIC NO. 59665**

Imada, Taijiro

INCINERATOR DESIGNED TO REMOVE SMOKE, ODORS, AND DUST CONCURRENTLY WITH THE INCINERATION. *(Datsuen, dasshu, jojin kenyo shokyaku sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-10017. 4p., March 7, 1974. 2 refs. (Appl. Feb. 4, 1969, 1 claim).*

The main unit of the incinerator is placed on a ground level mounting platform. It is divided into primary and secondary combustion chambers by a vertical partition wall provided with several holes. Beneath the secondary combustion chamber is an underground dust collection room which communicates with the secondary combustion chamber through a duct pipe. An underground tunnel made of four pipes connects the dust collection room and the filter chamber installed outside the incinerator. A blower fan opens above the filter in the filter chamber and is connected to the exhaust duct. The combustion gas generated in the primary combustion chamber flows through the holes of the partition wall into the secondary combustion chamber and downward into the dust collection chamber where the dust is removed by gravity settling. The combustion gas is cooled and the water content of the gas is condensed to facilitate further removal of the dust. It is deodorized and exhausted through the stack.

36639 **APTIC NO. 59794**

Ishida, Hitoshi

ON AIR POLLUTION CONTROL MEASURES. *(Taiki osen boshi taisaku ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(1):16-22, Jan. 1974.*

Current control measures for nitrogen oxides, sulfur oxides, and photochemical smog and the air pollution monitoring system in Japan are discussed. The new environmental standard for nitrogen dioxide, calling for daily averages of hourly values to be less than 0.02 ppm, has been enforced since May 8, 1973. The target date for this standard is 5 years from the start of its enforcement. So far only one station in 105 has recorded a value conforming to this standard. Similar standards for NOx from stationary sources such as boilers were set up in Aug. 1973. Sulfur oxides standards were revised to 0.04 ppm and the standard for photochemical oxidants was set at 0.06 ppm. There are 791 stations measuring sulfur dioxide in 285 cities in Japan and 176 stations measuring NOx in 112 cities. These numbers are increasing. New air pollution control measures to be introduced this year include total volume control systems, restriction of hydrocarbons, establishment of government-certified air/water pollution measurement specialists, expansion of the monitoring network, and studies on the need for control of other air pollutants.

36640 **APTIC NO. 59673**

Itaya, Toru and Kazuo Matsumoto

ELECTROSTATIC PRECIPITATOR. *(Denki shujinki). Text in Japanese. (Tsutsunaka Plastic Industry Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 49-8142. 5p., Feb. 25, 1974. 1 ref. (Appl. March 31, 1969, 1 claim).*

In a conventional electrostatic precipitator (EP), the electrode is either a flat-plate type or tubular type. The flat-plate electrode must have a large surface area to be effective and it is very heavy and difficult to handle. It is also more likely to become warped due to its large and thin structure. The warping is more noticeable with electrodes made of synthetic resin, due to its expansion and contraction caused by temperature changes. With the tubular electrode which encloses the discharge electrode line, the electric field is formed only in the electrode. This means that the outside spaces between the tubular electrodes are not used for the dust collection activity. The new dust collecting electrode arrangement suggested here is designed to eliminate these disadvantages. A number of square struts are installed upright with a proper and equal spacing from one another. Each square strut has a groove on each corner along its overall height, into which a dust-collecting flat-plate electrode is inserted. When all the dust-collecting electrodes are installed, the interior of the EP is divided into a number of small compartments whose four sides are the dust-collecting electrodes. A discharge electrode line hangs from above in each compartment. The dust-collecting plate made of a synthetic resin has a conductor buried inside. In this arrangement, each dust-collecting plate is smaller in area and supported by two struts from both sides, therefore protected from possible warping. Since all the interior space is divided into a number of compartments by a number of dust-collecting electrodes, the space is fully utilized for dust collection.

36641 **APTIC NO. 60234**

Ito, Ryota

BAG FILTER. *(Baggu firuta). Text in Japanese. Preprint, Japan Society of Materials Science, Kyoto, p. 195-209, 1974. 2 refs. (Presented at the Symposium on Pulverization and Dust Control, Kyoto, Japan, Feb. 20-21, 1974.)*

All aspects of modern bag filters are discussed. A modern bag filter can handle a gas with dust concentration of 1/10 100 g/cu m, often 1/100 1000 g/cu m, and temperatures up to 250 C. The filtration speed is generally in the range of 0.3-5 m/min and usually 0.6 2 m/min, while the pressure loss is 50 - 250 mm H2O or 300 mm H2O at maximum. The dust-collecting efficiency is 99.5%, the highest of all practical dust collectors. The life of the filter cloth ranges from 6 mo to several yr, the average life being 1 yr or 10,000 to 100,000 dedusting operations. The installation cost of a bag filter unit is estimated at about $14-50 per gas volume of 1 cu m/min. Construction of a bag filter including type of fabric, shape, gas flow direction, filtering direction, and dedusting method is fully discussed. The maintenance methods discussed include the shaking system, the collapsing system, the reverse jet system, the pulse system, and the reverse flow/vibration system in which the dedusting is performed by both the reverse flow of air intermittently produced by a rotary valve and the vibration of the filter cloth caused by the intermittant flow of air. Bag filter treatment of high temperature gases is also discussed.

36642 **APTIC NO. 59851**

Jansen, Heinz A.

LARGE-SCALE ARC FURNACES FOR STEEL PRODUCTION. *(Grosstechnische Lichtbogenoefen zur Stahl-Erzeugung). Text in German. Chem. Ing.-Tech., 46(4):136-138, 1974. 10 refs.*

The state-of-the-art of steel production in electric arc furnaces is discussed. Through introduction of the ultra high power principle, the construction of high capacity furnace units became feasible. The waste gases from electric arc furnaces can be rather easily cleaned of dust. The dusts developing at the melting and refining of steel are either drawn off through a separate lid hole or through exhaust pipes above the furnaces. The dust-laden gases are cleaned in electrostatic precipitators, cloth filters, or scrubbers. Modern arc furnaces permit a simpler and less costly dust collection than older steel production processes such as the Siemens-Martin process. This fact led in several cases to the closing of old plants and to the erection of electric arc furnaces instead. These furnaces are also well suited for melting scrap.

36643 **APTIC NO. 60152**

Kager, H. and A. Michel

CABLE PROCESSING PLANT FOR THE RECOVERY OF METAL WHICH MEETS ALL DEMANDS FOR THE PROTECTION OF THE ENVIRONMENT. *(Erstellung einer den Forderungen des Umweltschutzes entsprechenden Kabelverwertungsanlage). Text in German. Umweltschutz- Staedtereinig (Vienna), 11(1):7-9, 1974.*

The cable processing plant consists of an incinerator, thermal afterburner, cooling system, and jet and venturi scrubbers. A low temperature waste gas develops consisting mainly of soot, carbon monoxide, and unburned hydrocarbons. It may also contain hydrogen chloride from polyvinylchloride insulated cables and sulfur dioxide from bitumen-soaked paper insulated earth cables. Soot, unburned HC, and combustible insulating material are removed from the waste gas in an afterburner preheated to 800 C. After cooling, the waste gas goes to a jet-scrubber with laterally arranged nozzles where it is brought into close contact with an alkaline scrubbing fluid. Here dust particles, HCl, and SO2 are washed out. The clean waste gas goes to a venturi scrubber, after which it is discharged into the atmosphere. Measurements of the cleaned waste gas yielded maximum concentrations of 138 mg dust, 105 mg unburned HC, 11.5 mg HCl, less than 1.5 mg SO2/cu m, and a Ringelmann tone of less than 2.

36644 **APTIC NO. 59966**

Kamiya, Y.

DESULFURIZATION OF HEAVY OIL BY THERMAL CRACKING AND GASIFICATION - AN APPROACH TO CLOSED SYSTEM COMBUSTION. *(Jushitsuyu no netsubunkai oyobi gasuka niyoru datsuryu - nensho no kurozudoka e no apurochi). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 4(1):753-757, Jan. 1974. 18 refs.*

Heavy oil desulfurization by thermal cracking and gasification is discussed as the most promising techniques for prevention of air pollution, especially for removal of heavy metals. The fundamental reactions involved in heavy oil cracking and gasification partial oxidation are discussed. Processes in which heavy oil is cracked at relatively low temperatures (500-600 C) and at high temperatures (800-900 C) are discussed. Examples of the partial oxidation gasification desulfurization process are given, and the problems of oxygen supply and soot formation are discussed. These processes will facilitate the use of closed systems for steam plants.

36645 **APTIC NO. 59675**

Katsuta, Sumiro

ADSORBENT FOR REMOVAL OF HARMFUL GASEOUS SUBSTANCES. *(Kisansei yugai seibun jokyozai). Text in Japanese. (Dainippon Jochugiku Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 49-3397. 3p., Jan. 25, 1974. (Appl. Sept. 12, 1964, 1 claim).*

An adsorbent consisting of an oxidizing agent and green tufa, which is mainly composed of molybdenite and Montmorillonite, is highly effective in removing sulfur dioxide and carbon monoxide contained in combustion gases of petroleum. Green tufa is widely found along the Japan Sea coast of Hokkaido and Honshu. The oxidizing agent may be lead peroxide, potassium permanganate, or lead oxide. An oxidizing catalyst such as palladium, cadmium, platinum, or aluminum may be used in place of, or in combination with the above-mentioned oxidizing agents. The mixing ratio between the green tufa and the oxidizing agent or catalyst may be varied according to type of application. In an example of the embodiment, 300 g of the green tufa powder was mixed with the same amount of lead peroxide powder and contained in a tubular plastic container whose both ends were closed with perforated lids. Used in a car, this exhaust gas cleaner gave 100% SO2 removal efficiency at the outset, 99% at 1000 km of mileage, and 91% at 2000 km. These figures were 100%, 96%, and 80% for the conventional exhaust gas cleaner of lead peroxide and active carbon, each 350 g.

36646 **APTIC NO. 60078**

Kawaguchi, Kaname

THE TRIAL OPERATION RESULTS OF FLUE GASES DESULFURIZATION PLANT BY WET PROCESS. *(Uerumanrodo shisshiki haien datsuryu sochi no shiunten jisseki). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 25(1):61-72, Jan. 1974.*

The large-scale stack gas desulfurization plant at Nishi Nagoya Thermal Power Plant handles 620,000 N cu m/hr of stack gas with a 90% desulfurization rate. The process consists of a scrubbing/ absorption process, a regeneration process, a sulfuric acid manufacturing process, and a waste water disposal process, all of which are fully discussed. The plant is automated with a logic sequential control and a special arrangement which prevents insufficient contact of the gas with the absorbent, even at low load operation. A bypass channel for the stack gas is provided, which opens automatically when the desulfurization plant malfunctions, protecting the boilers. Use of anti-corrosion materials and white smoke control measures are added features. The results of 4 months of operation of the plant are discussed. The desulfurization efficiency is 91.7% at the exit of the desulfurization device and 90.7% at the entrance to the stack. The H2SO4 obtained as a by-product is 98.64% pure. The present absorbent fails to absorb nitrogen oxides and the dust removal efficiency is rather low.

36647 **APTIC NO. 60004**

Kawauchi, Kaoru

NOX REDUCTION MEASURES FO? SMALLER BOILERS. *(Chusho boira no NOx teigen taisaku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(2):127-132, Feb. 1974.*

Oxides of nitrogen (NOx) emission standards for stationary sources, effective as of August 2, 1973, are outlined. The emission standards are 130 ppm for newly installed boilers using gas fuel, 17C for those previously installed, 480 for newly installed boilers using coal, 750 or 600 for those previously installed, 180 for newly installed boilers using liquid fuel or crude oil tar, and 230 or 280 for those previously installed. The NOx reduction measures listed include low excess air (low oxygen) combustion, the lowering of preheated air temperature, the reduction of combustion chamber load, the improvement of heat conduction, two stage combustion, exhaust gas recirculation, and alternative fuels. The exhaust gas denitrization processes include the hydrogen sulfide method, the ammonia method, the chlorine-ammonia method, the copper-alumina catalyst method, the alkali method, the the magnesium hydroxide method, and the sulfuric acid method. A chemical denitrization process is required to achieve 90% or higher denitrization of exhaust gas. Nevertheless, 30-40% denitrization efficiency is attainable for smaller boilers simply by changing the burner to a low-NOx burner. With this much reduction of NOx emission, it is possible for most smaller boilers to meet the NOx emission standards. The Yoshimi boiler featuring use of the Caloric Burner is introduced with its NOx reduction efficiency shown in graphs.

36648 **APTIC NO. 59895**

Kleinschmidt, Albert

DUST COLLECTION AT DRYERS, PARTICULARLY IN THE ROAD CONSTRUCTION INDUSTRY. *(Entstaubung von Trocknungsanlagen insbesondere in der Strassenbauindustrie). Text in German. Bitumen Teere Asphalte Peche, 25(3):107-109, 1974.*

In dryers used in road construction, waste gases with temperatures between 140 and 220 C develop; if asphaltic mastic is treated, the waste gases reach temperatures up to 380 C. For dust collection, thy waste gases are stepwise cooled to the entrance temperature of cloth filters. In the cooler, sand is separated to a large extent so that, for instance, at a grain size of 90 micron, only 13% of the sand gets to the filter. The gases are cooled to 130 and 120 C. The cooled gas flow falls downward into the envelope type filter bags. The envelopes are made of an acid resistant felt. The filter bags are cleaned by an air jet blown pulsatingly into the envelopes by a ventilator. Through the hydraulic effect of the ventilator, the temperature rises slightly from the intake side to the blowing side, through which temperature losses are avoided. The envelopes are loaded from the external side and cleaned from the internal side.

36649 **APTIC NO. 59998**

Koerbel, W.

A NEW PROCESS FOR THE JOINT INCINERATION OF TRASH AND SEWAGE SLUDGE. *(Eine neue Verfahrenstechnik fuer die gemeinsame Verbrennung von Muell und Klaerschlamm). Text in German. VGB Kraftwerkstechnik, 54(2):101-104, 1974. 1 ref.*

A new process for the joint incineration of trash and sewage sludge is described which uses the heat from waste incineration as auxiliary heat for sludge incineration. Immediately next to the trash incinerator is a dryer to which quantities of dried sewage sludge are supplied. The dryer automatically draws on the combustion gases from trash incineration. The sludge is dried to a residual water content of 10% and simultaneously comminuted. The product thus treated is then injected into the trash combustion chamber with a temperature of 200 C. This method permits exact dosing of the sludge quantity with regard to the trash quantity. The entire preliminary sludge treatment steps take place without access of air so that no annoying odors can develop. The method also permits a high water content in the sewage sludge so that the required facilities for dewatering the sludge can be simple and inexpensive. The grate in the joint combustion chamber is designed for optimum trash incineration. The pulverized sewage sludge reduces the temperature of 1050 C prevailing for trash incineration rapidly to 800 C. In a following waste heat boiler this temperature is further reduced to 250 C. The steam is used for remote heating and for generation of the power consumed in the incineration plant.

36650 **APTIC NO. 59653**

Kurz, German

THERMAL AND CATALYTIC REDUCTION OF NITROGEN OXIDES IN INDUSTRIAL WASTE GASES. *(Thermische und katalytische Reduktion der Stickoxide aus Abgasen der Industrie). Text in German. CZ-Chem.-Tech., 3(1):23-24, Jan. 1974.*

The mechanisms of the thermal and catalytic reduction of high and low concentrations of nitrogen oxides which occur in industrial waste gases, e.g., from nitric oxide production, are described. If nitrogen oxides are present in high concentrations up to 100% along with oxygen, they are best reduced by the thermal process. Before introduction into the reaction chamber, the waste gas is mixed with combustible gas used as reducing gas in such a manner that complete conversion of free oxygen and of the oxygen content in the nitrous gases into carbon dioxide and water is guaranteed. This mixture is added to hot waste gases containing carbon monoxide and hydrogen, and reduction is done by means of a high-speed burner at a minimum temperature of 1500 C under air deficiency conditions. Regardless of the initial nitric oxide concentration, the residual NO concentration can be reduced to 1500 ppm. When nitrogen oxides are present in low concentrations with a small quantity of oxygen, they are reduced catalytically after an admixture of hot, CO and H2-containing waste gases at 300-500 C under air deficiency conditions. Residual concentrations of about 10 ppm can be reached by the use of two-stage reduction, using platinum in the first stage, and palladium in the second stage. High requirements on the residual nitrogen oxide concentrations can be met by combinations of the catalytic and thermal reduction processes. 0

36651 **APTIC NO. 59818**

Latzko, D. G. H.

ALTERNATIVES FOR ENERGY GENERATION AND TRANSPORT. *(Alternatieven voor energieopwekking en -transport). Text in Dutch. Gas, no. 94:41-59, Feb. 1974. 37 refs.*

The state of the art and future perspectives in energy generation and transport are surveyed. Fossil fuels including hydrocarbons, uranium, thorium, lithium, seawater, organic wastes, gravity, geothermal energy, wind, and solar energy are the actual and potential energy sources. Studies on energy generation by means of fuel cells, solar cells, gas turbines, magnetohydrodynamic reactors, thermionic converters, by fusion, and hydrogen are reviewed. Hydrogen as a fuel has the advantages of reducing transport costs, being suitable for use in vehicles, and by causing practically no air pollution, apart from minute quantity of nitrogen oxides when incinerated.

36652 **APTIC NO. 59485**

Lorenzi, L., Jr.

PLANT DEVELOPMENT FOR CHEMICAL DESULFURIZATION OF COAL. *Preprint, American Chemical Society, 16p., 1974. 1 ref. (Presented at the American Chemical Society, Meeting, Los Angeles, Calif., 1974.)*

The Meyers Process was developed for cleaning coal by removing the pyritic sulfur in coal while maintaining the structural integrity and physical characteristics of coal s organic matrix. The coal is leached with aqueous ferric sulfate solution to convert the iron pyrite into free sulfur and dissolved iron sulfate. These reaction products are formed in a molar ratio of 1.5:1 sulfate:sulfur. The schematic flow of the process, slurry preparation and reaction sections, design of the plant, and plant economics are discussed. The cost of the Meyers process is $0.30/million Btu.

36653 **APTIC NO. 59971**

Maeda, Isamu and Hiromi Tanaka

DESULFURIZATION DEVICE USING ACTIVE CARBON. *(Kasseitan o shiyo shita datsuryu sochi). Text in Japanese. (Sumitomo Shipbuilding and Machinery Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-11551. 2p., March 18, 1974. (Appl. Oct. 15, 1970, 1 claim).*

This desulfurization device features a new, effective active carbon regeneration system. The exhaust gas containing sulfur dioxide and other pollutants is taken into the adsorber unit packed with the moving layers of active carbon. The active carbon which has adsorbed SO2 is continuously taken into the desorber unit in which SO2 is separated from the active carbon by means of a comparatively high-temperature inert gas. The active carbon which has desorbed SO2 is taken into the sieving unit in which the granular active carbon is separated from the powder carbon produced during the transfer. The granular active carbon is then fed back into the adsorber unit for reuse. The dust and the active carbon powder are taken into the desorbent gas generation furnace and burned to produce the desorbent gas or carbon monoxide gas. This high-temperature CO gas is supplied to the desorber unit via the pipeline equipped with a heat exchanger that adjusts temperature of the desorbent gas. The CO gas reacts with SO2 adsorbed in the active carbon to prevent oxidation of the active carbon.

36654 **APTIC NO. 60184**

Maekawa, Koyo

CONCRETE MEASURES FOR BUILDING MANAGEMENT CENTERING AROUND INDOOR AIR POLLUTION CONTROL. *(Shitsunai kukiosen o chushin toshita birukanri no gutaisaku). Text in Japanese. Preprint, Japan Air Cleaning Assoc., Tokyo, p. 45-64, 1974. 17 refs. (Presented at the Technical Training Conference on Air Cleaning, 12th, Tokyo, Japan, March 27, 1974.)*

The causes of indoor air pollution, the efficiency of air filter systems, the problems of indoor air conditioning, and control measures are discussed in detail based on survey results. When atmospheric air is classified into indoor air, outside air adjacent to the building in question, and the atmosphere in general, pollution of the indoor air generally parallels that of the outside air, although with some time lag and decreased amplitude. Dust concentrations of air inside and outside four buildings, measured in terms of optic density, are discussed. In one of the four buildings surveyed, the optic density value of dust concentration indoors was 0.02 with the filtered air supply of 0.004 in OD against 0.04 of the outside air when air-conditioned by the dry type air filter/electrostatic precipitator combination. The filtered air showed 0.014, or three times the OD value when the air filter was operated alone. Another similar study was made on concentrations of sulfur dioxide gas indoors and outdoors. The dust removal efficiency of the air conditioning system in each of four buildings was investigated. The average efficiencies were 86%, 94%, 20%, and 55%. Sources of indoor air pollution, problems of building construction with respect to indoor air pollution, the types and performance of various air conditioning systems, and problems of maintenance of indoor air pollution controls are discussed.

36655 **APTIC NO. 59312**

Marier, P. and H. P. Dibbs

THE CATALYTIC CONVERSION OF SO2 TO SO3 BY FLY ASH AND THE CAPTURE OF SO2 AND SO3 BY CAO AND MGO. *Thermochimica Acta, 8(1,2): 155-165, Jan./Feb., 1974. 21 refs.*

The formation of sulfur trioxide from sulfur dioxide and oxygen is capable of catalysis by iron oxide in the fly ash from a coal-fired boiler. The amount of SO3 produced is dependent on the iron oxide content of the fly ash and on the oxygen concentration of the gas stream. Carbon in the fly ash significantly reduces the formation of SO3. The removal of SO2 from a gas stream by calcium oxide and magnesium oxide is enhanced by the catalytic conversion of the SO2 to SO3, as SO3 is more easily captured than SO2 by these oxides. The formation of SO3 and its removal from the gas stream depend upon the reaction temperature, the oxygen concentration of the gas stream, and the flow rate of the gas. (Author abstract modified)

36656 **APTIC NO. 59792**

Matsuura, Yuzuru

TREND IN RESEARCH AND DEVELOPMENT OF POLLUTION-FREE ENGINE. *(Mukogai enjin no kenkyu kaihatsu doko). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 48(3):86-95, March 1974. 8 refs.*

The field of research and development of automotive emissions control devices and pollution-free automotive engines is reviewed. The automotive exhaust gas emission control standards for hydrocarbon, carbon monoxide, and oxides of nitrogen tentatively set up by the U. S. and California are reported along with the 1973 Japanese counterparts. The exhaust gas purification techniques and devices introduced include engine modification, an air injection system, a thermal reactor, an exhaust gas recirculation system, and a catalytic converter. The modified, anti-pollution gasoline engines briefly described herein include the PROCO engine (developed by the U. S. Ford), the TEXACO engine, the MCP or Mitsubishi Combustion Process engine (Mitsubishi, Japan), the Newhall engine (Wisconsin Univ.), the Meyers/Uyehara 3-valve type engine (Wisconsin Univ.), the CVCC or Compound Vortex Controlled Combustion engine (Honda, Japan), the Fiat Strato engine, the LNG engine (Shell), and seven others. New power sources being developed as anti-pollution engines also mentioned include the gas turbine engine, the steam engine, the Stirling engine, and the battery-powered engine.

36657 **APTIC NO. 59562**

McKean, W. T., Jr. and J. S. Gratzl

INDIGESTER BLACK LIQUOR OXIDATION FOR ODOR CONTROL IN KRAFT PULPING. (FINAL REPORT). *North Carolina State Univ., Raleigh, Dept. of Wood and Paper Science, Environmental Protection Agency Grant AP-01269-02, Program Element 1AB015, EPA-650/2-74-005, ROAP 21ADC, 120p., Jan. 1974. 37 refs.*

Laboratory studies were used to describe the major reaction routes, key inhibition reactions, and kinetics of methyl mercaptan and dimethyl disulfide during oxidation of black liquor. This provided the basis for helping to explain low oxidation efficiencies with respect to hydrogen sulfide, methyl mercaptan, and dimethyl disulfide during black liquor oxidation at temperatures from 60 to 90 C and suggests that high temperature oxidation should be more efficient. In small scale laboratory flow equipment, softwood and hardwood black liquor was oxidized at temperatures between 80 and 170 C. Oxidation at temperatures above 100 to 120 C resulted in efficient oxidation of all three malodorous compounds with no liquor reversion during subsequent storage and distillation. Oxygen consumption was about 125% of theoretical below 140 C but increased to about 200% at 170 C. Application of this approach to batch and continuous digester systems is discussed. Preliminary experiments showed that injection of small amounts of oxygen into the liquor circulation line during the early stage of pulping could increase pulp yield by 1-3%, depending on the final pulp kappa number. If this yield increase could be obtained in combination with indigester black liquor oxidation, the net costs for odor control in mills using batch registers would be very attractive. (Author abstract)

36658 **APTIC NO. 59996**

Meyer, H.

EXPERIENCE WITH THE OPERATION OF ANNULAR SHAFT AT THE DORNAP LIME WORKS. *(Betriebser fahrung mit Ringschachtoefen im Kalkwerk Dornap). Text in German. Zement-Kalk-Gips (Wiesbaden), 27(1):8- 13 1974.*

The annular shaft kilns installed at Dornap are pyroprocessing units which are easy to operate and to control and which produce highly reactive soft-burned lime of constant quality. No deterioration in quality occurs even when the kiln is fed with stone having a relatively wide particle size range. The kilns have no installation in the preliminary heating zone. Therefore the exit gas flow remains quite calm, allowing the dust to fall out to the point that the dust quantity in the waste gas is less than 100 mg/cu m. The kilns are equipped with wet collectors and a multicyclone.

36659 **APTIC NO. 60297**

Miller, Peter and John L. Wilki

REMOVING VISIBLE OIL FUMES FROM TENTER FRAME EXHAUSTS. *Mod. Text., no. 2:21-23, Feb. 1974.*

A fiberglass-wool system for removing visible oil smoke from tenter frame stacks at a knit goods manufacturer and an impinger system for removing particulates and sulfur dioxide at textile plants converting from gas or oil to coal are reviewed. The improved fiberglass-wool fume control system consists of prefilters, finned cooling coils, a blower, and a CVM fume eliminator and is capable of handling the exhaust gas from two tentering frames with a design gas flow of 26,900 acfm each. Maintenance consists primarily of cleaning the filters once per week, and the unit has performed well since start-up. A Pentapure Impinger device has enabled one textile mill to operate its coal-fired boiler at one-third the minimum particulate levels permitted by State control regulations. The system collects all but 6 lbs of particulates and is also highly efficient in sulfur dioxide removal. The wet collector performs the operations of a dry collector and a wet scrubber via a unique process that uses the force of the exhaust stream itself to do the cleaning and consumes much less water. Introduction of common and inexpensive chemical agents with the water spray allows for high removal of SO2.

36660 **APTIC NO. 59981**

Minegishi, Takuo and Ikuyoshi Ushikubo

CONNECTOR DEVICE FOR DUST HOOD. *(Shujin fudo no setsuzoku sochi). Text in Japanese. (Nippon Air Filter*

Co., Ltd., Hiratsuka (Japan)) Japan. Pat. Sho 49-12881. 4p., March 28, 1974. (Appl. July 31, 1970, 1 claim).

This invention concerns the connection between the dust hood of a coke oven and the main exhaust duct. When coal is fed into a coke oven, a large quantity of gas containing dust is emitted from the feed port of the coke oven. This dusty gas is collected and discharged by connecting the dust hood to the main exhaust duct. For higher dust collection efficiency, however, the dust hood should be connected to the main duct only when the coke oven is actually operating. This makes it necessary to frequently attach and detach the dust hood to the main duct. The new connector device makes this frequent operation more efficient. A sliding horizontal duct supported by a horizontal frame and a guide rail is attached to the front end of the horizontal dust hood so that the sliding duct may be moved forward and backward. Incorporated in this front end section of the sliding duct is another sliding duct which can be tightly pressed onto the intake port of the main duct. This vertical front end section of the horizontal sliding duct is equipped with a roller at the front tip and a V-shaped guide frame at the back which automatically regulate the opening and closing.

36661 **APTIC NO. 60126**

Mohrmann, Hasso and Werner Marchlewitz

LOADING OF FIBER FILTERS WITH AEROSOLS. *(Beladung von Faserfiltern mit Aerosolen). Text in German. Staub, Reinhaltung Luft, 34(3):100-102, March 1974. 6 refs.*

The flow resistance and the penetration of fiber filters were measured as functions of the burden of solid and liquid aerosal particles. In all tests the same glass fiber paper was exposed to a constant flow of 6 cm/sec of monodisperse aerosols with particle diameters of 0.4 micron. The resistance of both solid and liquid aerosols increases exponentially with the aerosol load. In the first case the increase is significantly steeper and thus more critical for evaluation of the long-term properties of filters. The extent of penetration drops if loaded with solid particles, but does not agree with the theoretically determined penetration. For liquid aerosols, the load which doubles the resistance is about one-third of the filter weight. In this case, the increasing penetration limits the useful life of the filter. Empirical equations are given for all functions investigated.

36662 **APTIC NO. 59729**

Moran, John B.

LEAD IN GASOLINE. IMPACT OF REMOVAL ON CURRENT AND FUTURE AUTOMOTIVE EMISSIONS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 33p., 1974. 31 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974.)*

The impact of removing lead from gasoline on current and future automotive emissions is examined. Removal of lead will require increased aromatic percentages in fuels to achieve the same octane rating and will result in increased exhaust polynuclear aromatic hydrocarbons, phenolics, and aldehydes. However the required reduction in exhaust hydrocarbons and carbon monoxide has resulted in substantial reductions in the emission of these nonregulated products, and advanced control systems developed to achieve the stringent 1975 standards will reduce such nonregulated emissions to levels of 1/100 of those from nonregulated (pre-1966) vehicles. The net result should be a decline in the emission of such products on a national basis as a greater percentage of controlled vehicles are introduced into the marketplace. Alternate power plants will also reduce the need for the presently high octane ratings achieved either by Pb or greater aromatics percentage. The stepwise removal of Pb from gasoline will probably neither result in additional emissions of adverse pollutants from motor vehicles nor materially affect the diminishing national levels of such emissions.

36663 **APTIC NO. 59975**

Odagiri, Wataru and Mitsuaki Sugimoto

OPERATING DEVICE OF ELECTROSTATIC PRECIPITATOR. *(Denki shujinki no unten sochi). Text in Japanese. (Hitachi, Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-12224. 3p., March 23, 1974. 1 ref. (Appl. Feb. 3, 1967, 1 claim).*

While a higher voltage gives electrostatic precipitators (EP) a higher dust collection efficiency, it often causes a spark discharge which can be transformed into an electric arc discharge if the voltage is too high. An EP functions with the spark discharge but not when the arc discharge takes place. Even during the spark discharge, the dust collection efficiency is lower due to the voltage drop. Previously the power source voltage had to be adjusted manually to provide the optimum frequency of the spark discharge. The direct current supplied by the power source to the EP contains a pulsating charge current component and the control method devised under this invention transforms this pulse to a current having a specified crest/time area and integrates it to obtain input which is proportional to the frequency of the discharge. When frequency of the spark discharge is more or less than the prefixed value, the power source voltage is automatically adjusted for the preset optimum frequency, thereby ensuring the highest dust collection efficiency at all times.

36664 **APTIC NO. 59671**

Okubo, Yasui and Masami Ogasawara

FLAT PLATE TYPE WET ELECTROSTATIC PRECIPITATOR. *(Heibanshiki shisshiki denki shujin sochi). Text in Japanese. (Kowa Seiko Co., Ltd., Kitakyushu (Japan)) Japan. Pat. Sho 49-8141. 3p., Feb. 25, 1974. (Appl. March 13, 1969, 1 claim).*

This invention pertains to improvement of the flat-plate electrodes of a wet electrostatic precipitator (EP). This type of dust-collecting electrode plate is subject to corrsion caused by sulfur trioxide and other corrosive substances contained in the gas if they are used in a sulfuric acid manufacturing or similar plant. The new flat-plate electorde is laminated with two or more layers of a corrosion-resistant high molecular weight compound (epoxy) and glass wool. The inside glass wool layers combined with other layers of the high molecular weight compound prevents possible warping of the electrode at high temperatures. This warp-free characteristic makes it possible to keep the electrodes properly spaced under all operating conditions, thus providing higher dust-collecting efficiency. The other advantages include light weight, low cost, and easy cleaning.

36665 **APTIC NO. 60223**

Pilat, Michael J., Steven A. Jaasund, and Leslie E. Sparks

COLLECTION OF AEROSOL PARTICLES BY ELECTROSTATIC DROPLET SPRAY SCRUBBERS. *Environ. Sci. Technol., 8(4):360-362, April 1974. 14 refs.*

Theoretical calculations and experimental measurements showed that the collection of small aerosol particles (0.05-5 micron diameter) by water droplets in spray scrubbers can be substantially increased by electrostatically charging the droplets and particles to opposite polarity. Measurements with a 140 acfm two-chamber spray scrubber (7 sec gas residence time) showed an increase in the overall particle collection efficiency from 68.8% at uncharged conditions to 93.6% at charged conditions with a dioctyl phthalate aerosol (1.05 micron particle mass mean diameter and 2.59 geometric standard deviation). The collection efficiency for 0.3 micron particles increased from 35% to 87% when charged. (Author abstract)

36666 **APTIC NO. 59852**

Riethmann, H.

THE DESULFURIZATION OF FLUE GASES. *(Die Entschwefelung von Rauchgasen). Text in German. Oel Gasfeuerung, 19(2):82-86, 1974. 2 refs.*

Various processes for the desulfurization of flue gases are reviewed, such as the pulverized limestone process, the absorption of SO2 by alkaline solutions, and dry processes with metal oxides or activated coal. The injection of calcium carbonate directly into the furnace has the disadvantage of a low rate of desulfurization (only 20 to 30%). The process stands little chances to be used on a grand scale. The absorption of SO2 by alkaline solution brings sufficiently high degrees of desulfurization; the necessary investments are bearable. However, the waste product is a problem particularly if the process is applied in large plants. Versions of the process include, the lime/gypsum wet process, the caustic soda/sodium sulfite wet process, and the ammonium sulfate wet process. Dry processes with metal oxides or activated coal can be applied without major technical difficulties, but compared to the absorption process with alkaline solution, the facilities are more sophisticated and more expensive. A brief description of all mentioned processes is given. Only in few cases is pure sulfur obtained from flue gas desulfurization. The sale of sulfur poses one of the major problems of desulfurization. Sodium sulfite and ammonium sulfite will be also difficult to sell. The largest demand exists for gypsum. The demand for the byproduct from desulfurization will greatly influence the economy of the process.

36667 **APTIC NO. 59894**

Rouvel, Lothar and Helmut Schaefer

SOLAR ENERGY: HARDLY HOPE FOR EUROPE. *(Sonnenenergie: kaum Hoffnung fuer Europa). Text in German. Umwelt (Duesseldorf), 4(2):28-32, 1974. 6 refs.*

From a graph showing the direct solar radiation and the sky radiation incident on a particular plane over the course of a year for the Federal Republic of Germany, it can be deduced that in summer only 55% of the maximum daily radiation and in winter only 10% are available for technical use. For covering the power demand of, for instance, a refrigerator by solar energy, a solar cell area of 1 sq m would be necessary under the conditions in the Federal Republic of Germany and the present state-of-the-art. This then would cover the power demand of the refrigerator on just one cloudless day. Barely 1/3 of the annual demand could be covered by solar energy; 2/3 would have to be covered by other sources. The largest power users are domestic heaters. The use of solar energy to cover this demand would require expensive construction.

36668 **APTIC NO. 60006**

Sano, Hiroshi

EMULSIFIED LIME-BLOWING TYPE FLUE GAS DESULFURIZATION USING CALCIUM SALTS OF FATTY ACIDS. *(Shibosan karushumu o shiyo suru nyuka sekkai fukikomishiki haien datsuryu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(3):1503-1506, March 1974. 5 refs.*

A new stack gas desulfurization method, in which a fuel oil emulsified with a solution of calcium formate in water is burned, yields an 80% desulfurization rate. More recently, the calcium salts of fatty acids other than formic acid were experimentally applied to the emulsified lime-blowing stack gas desulfurization method. The fatty acids used were acetic acid, butyric acid, caproic acid, and caprylic acid, and the fuel oil used was an 0.5% sulfur class A heavy oil whose S content was adjusted to a definite content by the addition of thiophene, together with a non-ionic surface active agent of about 0.5 weight%. The reduction of sulfur oxides was proportional to the quantity of lime added in the Ca/S ratio range of 0 to 0.8. For an equivalent ratio, the desulfurization rate was 75 to 90%. There was no relation between the form of fatty acid and the desulfurization rate.

36669 **APTIC NO. 59444**

Schideler, H. W., W. O. Young, E. C. Weimer, S. M. Porter, F. E. Litty, and J. S. Reder

PULP DRYER POLLUTION ABATEMENT. *Sugar J., 36(9):9-13, Feb. 1974. (Presented at the American Society of Sugar Beet Technologists, General Meeting, 17th.)*

Beet pulp drying is discussed and the various problems of direct-fired drying are compared with those of other materials. The pulp drying operation is similar to other direct-fired drying operations. Dust emissions are difficult to control. Particles are fine in size and are carried by large columns of moist gases. Based on technical and economic considerations, no single add-on unit of available control equipment is well suited to this application. Methods for removing the particulate emissions include a device which is standard with most drying operations, the mechanical collector (cyclone) and add-ons as wet scrubber, fabric filters, and afterburners. An alternative to the add-on concept of dust removal is a more favorable flow design in which dust-laden air is recycled and used in place of secondary air. The comparative cost of operation for the controls systems is tabulated.

36670 **APTIC NO. 60016**

Schlotmann, W.

THE INCINERATOR FOR SPECIAL REFUSE ON THE UTILIZATION UNION SPECIAL REFUSE DISPOSAL SITES CENTRAL FRANKONIA IN SCHWABACH/BAVARIA. *(Die Sondermuell-Verbrennungsanlage beim Zweckverband Sondermuellplaetze Mittelfranken in Schwabach/Bayern). Text in German. VGB Kraftwerkstechnik, 54(1):33-38, Jan. 1974.*

The incinerator for special refuse in Schwabach, Bavaria, burns solid, pasty, and liquid refuse such as oil-polluted soil, consumed organic solvents, sludge from decanters, artificial resins, mineral fats, and polyvinylchloride. The solid matter is incinerated in a rotary kiln with an afterburner and combustion chamber for liquid refuse. The liquid refuse is atomized with steam. The stack gases go first to an afterburner and then to a cooler. The gas is cleared of dusts by an electrostatic precipitator, following which it is discharged from a 60-meter stack.

36671 **APTIC NO. 59421**

Schumm, H. P.

TECHNICAL REQUIREMENTS FOR AIR CONDITIONING SYSTEMS IN HOSPITALS. *(Technische Erfordernisse bei Klimaanlagen in Krankenhaeusern). Text in German. Oeffentliche Gesundheitswesen (Stuttgart), 36(1):30-41, 1974.*

Air conditioning systems have the tasks of cleaning the air, warming or cooling it, moisturizing or demoisturizing it, sending the air into the room without creating drafts, and carrying off the spent air which in certain cases must be cleaned prior to discharge. The intake point for the ambient air must be carefully selected because close to the ground the germ and bacteria concentration is high, while higher above the ground level the general air pollution by industry and domestic heating is of greater influence. Today the intake point is usually arranged on a lateral wall underneath the roof. The individual components of an air conditioning system are discussed in detail. For very clean rooms, such as operating rooms, three filter stages for cleaning the ambient air are usually used. For removal of the finest particles, aerosol filters of finest glass, synthetic, or asbestos fibers which achieve collection efficiencies of 99.999% are nowadays available. The first filter for coarse dust particles serves for protecting the air conditioning equipment. The second filter stage reduces the germ number to a large extent. Special precautions such as adequate filtering area, tight sealing, accessibility of the aerosol filters, and installation directly ahead of the air exit must be taken at the design and installation of aerosol filters.

36672 **APTIC NO. 59666**

Shibata, Takeo

DUST-REMOVING FILTER DEVICE. *(Roka shujin sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-10026. 3p., March 7, 1974. (Appl. Nov. 29, 1969, 1 claim).*

A bag filter is designed to efficiently remove dust or other particulates from gas or liquid. The outer casing consists of a cylindrical middle section, a funnel-like lower section, and a conic upper section. The upper section is connected to the discharge unit which is equipped with a fan and a discharge port on the upper end. Inside the middle section is an inner tube which has an open bottom end and an upper end connected to a truncated motorized, cone-like filter. As a fluid substance is taken into the filter, it flows tangentially through the space formed between the outer casing and the inner tube and large dust particles are removed. The fluid substance then moves into the inner tube and is filtered again. The dust deposited on the filter element is shaken off by a vibrator.

36673 **APTIC NO. 59664**

Shigaki, Masahobu

STACK GAS DUST REMOVER. *(Haien dasuto hoshu sochi). Text in Japanese. (Takuma Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 49-10018. 3p., March 7, 1974. 1 ref. (Appl. Feb. 14, 1969, 1 claim).*

Since there is no dust collector that can completely remove the dust contained in flue gas from a boiler or furnace, the dust remaining in the stack gas flowing through an upright stack or chimney is partly deposited on the stack walls. The accumulated deposits of the dust often peel off the stack wall, especially when the boiler or furnace resumes operation after a temporary suspension or when the furnace or boiler pressure varies. In the case of a high-efficiency boiler, the temperature of the stack gas is below the dew point, so that acid water drops formed in the stack grow larger as they ascend with the gas through the stack. Such acid water drops and those containing dusts cause air pollution when discharged. The control device removes such dust or acid water drops. A tubular unit with a horizontal fan is installed at the top of the stack. The inner casing has a number of vertical slits and is enclosed by a tubular outer casing with a slanted bottom end. The dust in the stack gas is centrifugally removed as the stack gas is exhausted by the fan. The dust collected in the outer casing is sucked through the transport pipe into the flue between the boiler and the dust collector on the ground and collected.

36674 **APTIC NO. 59684**

Shimamura, Teiichi, Korehiko Nishimoto, Shinjiro Suzuki, and Hiroshi Tsuhara

DISPOSAL METHOD OF WASTE GAS FROM SINTERING EQUIPMENT. *(Shoketsuki haigasu shori hoho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-1961. 4p., Jan. 17, 1974. (Appl. Dec. 23, 1969, 1 claim).*

This invention pertains to removal of sulfur dioxide from waste gas of sintering equipment. It is essentially a pre desulfurization measure designed to be combined with the subsequent desulfurization equipment. In the sintering process, the point at which the concentration of the SO2 gas increases and that at which it decreases varies according to the operating conditions. This method is designed to give a more effective handling of the waste gas. The waste gas taken from the wind boxes known to give higher SO2 concentration at all times is disposed of by the ammonia method or another desulfurization method, while the waste gas from those wind boxes giving an SO2 concentration which varies with changes in the sintering condition is measured to monitor its SO2 concentration so that the gas may automatically be led into the settling chamber leading to the desulfurization device when the concentration is high. When low, the gas is also automatically led to another settling chamber and discharged into the atmosphere. The waste gas treated as above is then mixed with that coming out from those wind boxes giving consistently low SO2 concentrations and high temperature before being discharged into the atmosphere. This raises the temperature of the treated waste gas for effective atmospheric diffusion of the gas.

36675 **APTIC NO. 59854**

Sommers, Hans, Ludwig Rado, and Lajos Joos

GAS APPLICATION FOR THE BENEFIT OF ENVIRONMENTAL PROTECTION. *(Gasanwendung im Dienste des Umweltschutzes). Text in German. Gas Wasserfach, Gas/Erdgas, 115(2):69-90, 1974.*

Waste gases from furnaces fired with coking gas or natural gas contain generally 8 to 10 vol% carbon dioxide, 22 to 18 vol% water vapor and 70 to 72 vol% nitrogen. They furthermore contain various trace components of air and various other components which either stem from the fuel gas or are formed during combustion. Such components include carbon monoxide, hydrogen, oxides of nitrogen, aldehyde, hydrocarbons including polycyclic aromatics, dust, and sulfur dioxide. The SO2 concentration of the waste gases depends on the sulfur concentration of the gas. The admissible total sulfur concentration for natural gas is 150 mg/cu m and for city gas 200 mg/cu m. The SO2 emission at natural gas operation amounts to between 0 and 7 g/Gcal, at city gas operation to 20 to 50 g/Gcal. The formation of highly molecular carcinogenic hydrocarbons is very unlikely from gas-fired furnaces since gas contains only low-molecular hydrocarbons. Oxides of nitrogen have the greatest importance among the pollutants in waste gases from burning gas because they develop in relatively high concentrations. The reaction mechanism leading to the formation of NOx and the measurement of these pollutants are reviewed. Formation of the oxides of nitrogen depends not only on the fuel to-air-ratio but also on the burner construction. The measured NOx concentration in the waste gases from 29 different furnaces are listed in a table. The maximum NOx concentrations were always measured between lambda 1.05 and 1.8. The dispersion of waste gases in the atmosphere is reviewed. Gas-fired plants in the Federal Republic of Germany are subject to regulations which were originally passed for solid and liquid fuels. In view of the fact that the emissions from gas operated furnaces contain fewer pollutants in lower concentrations, it should be carefully studied whether these regulations are justified.

36676 **APTIC NO. 60015**

Stabenow, G.

OPERATING EXPERIENCES WITH THE INCINERATORS IN CHICAGO AND HARRISBURG. *(Betriebserfahrungen mit Muellverbrennungsanlagen in Chicago und Harrisburg/USA). Text in German. VGB Kraftwerkstechnik, 54(1):38-42, Jan. 1974.*

The Chicago incinerator, with a capacity of 1450 tons, and the Harrisburg incinerator (a smaller version of the same design) are described. The gases are cooled in a boiler and subsequently cleaned in a two-field electrostatic precipitator. Measurements of the condensable matter in the cleaned and uncleaned gas showed that the major part of it was collected in the electrostatic precipitator. The dust concentration in the cleaned gas is lower than the maximum allowable concentration, due mainly to the optimum combustion process, the uniform distribution of air, and the excellent performance of the electrostatic precipitator.

36677 **APTIC NO. 60335**

Statnick, R. M. and D. C. Drehmel

FINE PARTICLE CONTROL USING SULFUR OXIDE SCRUBBERS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., 23p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-231.)*

Data were obtained on the fine particle collection efficiency of sulfur oxide scrubbers at two power generating stations. A venturi and a turbulent contacting absorber (TCA) both with capacities of 30,000 cfm were tested at one site, while a venturi with 600,000 scfm capacity was tested at the other site. Fine particle collection efficiency was determined at three pressure drops for the TCA using a cascade impactor. The TCA showed high removal efficiencies, collecting more than 90% of submicron particles when the pressure drop was nearly 10 in. of water. The overall particulate removal in the TCA scrubber as determined by modified method five or by a Brink impactor was greater than 99% when the pressure drop was greater than 6 in. H_2O. Collection efficiency for both venturi scrubbers decreased rapidly with decreasing particle size in the fine particle region. (Author abstract modified)

36678 **APTIC NO. 59340**

Stenhouse, J. I. T.

THE INFLUENCE OF ELECTROSTATIC FORCES IN FIBROUS FILTRATION. *Filtration Separation (Purley), 11(1):25-26, Jan./Feb., 1974. 21 refs.*

Mathematical expressions are derived for the efficiency of collection of particles in fibrous filters due to an electrostatic mechanism in which either the particle or fiber or both are charged. The theory is based on the cellular model of flow through a filter and is in excellent agreement with published experimental data. An increase in the packing density of a filter has two effects. The streamline tortuosity is increased and causes an increase in collision efficiency due to interceptions and the fact that the particle is brought close to the fiber where the electrostatic forces are strongest. The electrostatic forces, however, will be effective over a shorter range, causing a reduction in the collision efficiency due to electrostatics. Calculations for the effect of filter packing density indicate that in the case of charged filters an increase in filter packing density will have little or no effect on the single fiber collision efficiency.

36679 **APTIC NO. 59672**

Tachibaba, Keisuke and Masahiro Kishi

DISPOSAL METHOD OF COMBUSTION EXHAUST GAS. *(Nensho haigasu shoriho). Text in Japanese. (Mitsubishi Heavy Industries, Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-9307. 4p., March 4, 1974. 2 refs. (Appl. July 13, 1965, 1 claim).*

Oxides of iron, manganese, or other heavy metals are added to color the previously used white absorbent for sulfur dioxide removal. In the conventional stack gas desulfurization method, a white powder of lime, dolomite, calcium hydroxide, or magnesium hydroxide is injected into the combustion chamber to absorb SO_2 and sulfur trioxide. However, a part of the white powder adheres to boiler surfaces as it flows toward and through the flue with the exhaust gas. The color of the powder adversely affects absorption of heat radiation and makes the cooling efficiency of the system much lower than originally expected, leading to operational troubles in the boiler. The colored powder of iron or magnesium oxide absorbs the radiation heat more effectively. Oxides of these heavy metals remain colored even under the high temperature conditions of a furnace. The substance formed by reaction of these colored oxides with the heavy oil ash gives a higher melting point and can therefore protect the boiler tube from corrosion. The oxides also provide a catalytic action which accelerates oxidation of SO_2 and SO_3.

36680 **APTIC NO. 60254**

Takashima, Akio, Takeshi Sakano, and Yoshinobu Hasegawa

WET TYPE NITROGEN OXIDES REMOVAL TECHNIQUES. *(Sankachisso no shisshiki jokyo gijutsu ni tsuite). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(3):193-207, March 1974. 9 refs.*

The MON absorption process for nitrogen oxides is outlined. Because the absorption reaction almost completely consumes the absorbent, the waste liquid is relatively easy to treat. The biggest problem in the process is the conversion of manganese dioxide to potassium permanganate. Development of good techniques for the conversion will permit great reduction of the cost of denitrization. Another feature of the MON process is that it is not affected by the presence of carbon monoxide or carbon dioxide and that it also accomplishes sulfur oxides removal.

36681 **APTIC NO. 59810**

Tarradellas and Bonnetain

ABSORPTION OF POLLUTANT TRACES IN GAS FLOWS. *(Absorption sur lit fixe de traces de polluants dan les effluents gazeux). Text in French. Chim. Actualites, no. 1523:44-46, Jan. 1974.*

The reaction mechanism of the absorption of 1% sulfur dioxide in nitrogen in fixed bed of calcium carbonate was studied in a temperature range of 550-850 C. A two-step reaction between SO_2 and $CaCO_3$, with the formation of calcium sulfite and carbon dioxide in the first step, and with the formation of calcium sulfate and elemental sulfur in a second step, was determined. The SO_2 retention was initially quantitative to reduce then exponentially, corresponding to a high SO_2 concentration in the purified gas. During the final stage of the absorption, the residual SO_2 concentration tended slowly to the initial concentration. The elimination of SO_2 occurred initially in a kinetic regime for SO_2 concentrations of up to 5500 ppm, and then in a kinetic regime of diffusion in the solid for SO_2 concentrations over 7500 ppm. The two stages were separated by a transitory stage between 5500 and 7500 ppm in which both mechanisms were effective.

36682 **APTIC NO. 59964**

Terazawa, Hedeei

MANUFACTURING METHOD OF ANTI-POLLUTION FUEL FOR INTERNAL COMBUSTION ENGINE (DIESEL ENGINE). *(Nainen kikan (diizeru enjin) yo kogai boshi nenryo no seizo hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-10965. 4p., March 14, 1974. 2 refs. (Appl. Feb. 19, 1970, 1 claim).*

The anti-polluting fuel manufactured by this method for an internal combustion engine, such as a diesel engine used in a vehicle or ship, greatly suppresses emissions of black smoke, carbon monoxide, sulfurous acid gas, and other pollutants. The fuel is composed of 0.5% alkaline earth metal salt of sulfonic acid, 9.5% spindle oil, 14.5% alcohol, 5.5% toluene, and 70% light oil. The proportion of light oil may be increased to 80% by reducing that of the other additives to 20%. The spindle oil is added to the alkaline earth metal salt of sulfonic acid and heated to 70 C. After confirming that both the metallic salt and the spindle oil have melted, the mixture is cooled to 50 C. Alcohol is then added and the mixture is stirred until it becomes transparent. Toluene is now added and the mixture is stirred until all the components are uniformly mixed. This mixture is then put into the light oil and stirred well.

36683 **APTIC NO. 59744**

Timson, George F. and James Helein

HOW AMOCO CONTROLS H2S CLEAN-UP. *Hydrocarbon Process, 53(1):115-116, Jan. 1974.*

Formerly, toxic hydrogen sulfide from additives batch processing was converted to the less hazardous, but still objectionable, sulfur dioxide which was discharged to the atmosphere. Now the H_2S is passed through a lean 20% diethanolamine (DEA) solution which removes 90% of the H_2S by absorption. A secondary absorber ensures complete removal. The sulfur recovery plant of the oil refinery supplies lean DEA and processes the rich DEA from the absorber bottoms. An electronic analog control was used to handle the

DEA supply and return problem. Four flow controllers, two level controllers, and one each of pressure, temperature, and ratio controllers were used to maintain a constant rate of DEA flow to and from the sulfur recovery plant.

36684 **APTIC NO. 59798**

Tokuhisa, Yoshio

CLOSED SYSTEM REFINERIES - PRESENT AND FUTURE. *(Seiyujo no kurozudo shisutemuka to sono mondaiten). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(1):21-26, Jan. 1974.*

Control measures for oxides of sulfur, oxides of nitrogen, dust, hydrocarbons, noxious odors, and solid wastes from oil refineries are discussed. In an oil refinery, most SOx emission is from combustion of fuel used for the plant itself. Reduction of this fuel consumption by improving the thermal efficiency of the plant is therefore most effective in reducing the sulfur oxides emission. Use of low-sulfur fuel also contributes to sulfur oxides reduction. Stack gas desulfurization processes are also useful in this regard. Use of light quality oil, preferably gas, is recommended for reduction of NOx emission. Improved combustion methods such as use of a low-NOx burner, two-stage combustion, and exhaust gas recirculation are briefly mentioned for NOx control. A few representative processes available for control of each pollutant previously mentioned are touched on.

36685 **APTIC NO. 60076**

Uchiyama, Hisashi

PRINCIPLE AND APPLICATION OF GAS ABSORPTION IN WETTED TRAY TOWER. *(Moredanato ni yoru gasu kyushu no genri to oyo). Text in Japanese. Kagaku Kojo (Chem Factory), 18(4):74-78, April 1974. 2 refs.*

A pilot plant stack gas denitrization process based on a wetted tray tower has led to construction of practical scale equipment which can handle 62,000 N cu m/hr. After removal of sulfur oxides, chlorine dioxide is added to the stack gas producing nitrogen dioxide from the oxidation of nitric oxide, and then the stack gas is washed first with water or alkali, and then with sodium sulfite or ammonium sulfite, reducing the nitrogen dioxide to nitrogen gas for removal. Alternatively, ozone can be added to oxidize the NO. In addition, a method has been developed by which sulfur dioxide can be removed simultaneously with NO2 following oxidation of the NO. With the wetted tray tower, 92 to 95% of the NO2 can be removed from a stack gas.

36686 **APTIC NO. 59920**

Wagner, A. J. (ed.)

STEAM-POWERED DUST COLLECTORS ATTAIN HIGH EFFICIENCIES ECONOMICALLY. *Mod. Casting, 64(2):58-60, Feb. 1974.*

An economical and highly efficient steam-powered dust collector has been successfully developed and operated at a steel mill and pipe shop installation. The device uses a high speed steam drive which creates its own draft; the draft draws exhaust gases into a mixing tube where process water is injected. Quick agglomeration is achieved with submicromic particulates, bringing them to manageable size for disposal in low pressure drop cyclones. The system handles particulates from 6-20 micron at efficiencies of more than 99%. A sulfur dioxide removal efficiency of 99.94% can also be achieved with the addition of chemically-treated water.

36687 **APTIC NO. 59331**

Wu, Ming-Shian and Joseph T. Zung

THE ROLE OF MOLECULAR FORCES IN THE SCAVENGING OF AEROSOL PARTICLES. *Environ. Letters, 6(2):77-94, 1974. 17 refs.*

The effects of intermolecular forces on the collection efficiency of submicron aerosol particles are studied. Intermolecular forces provide a certain region as an absorbent surface in the vicinity of the drop. Numerical results were obtained for the cases of a water drop collecting silver chloride aerosols and a water drop collecting submicron cloud droplets. The collection efficiency depends mainly on the diffusion process. Calculations made here agree reasonably well with recent experimental results of Kerker for AgCl aerosols for the case of small drop. (Author abstract)

36688 **APTIC NO. 59784**

Yamaguchi, Ginichi, Makoto Ishikawa, and Yoshihiro Nonaka

METHOD TO DISPOSE OF SMOKE ASH PRODUCED DURING COPPER SMELTING. *(Do seiren enbai shoriho). Text in Japanese. (Onahama Smelting Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-1377. 2p., Jan. 12, 1974. (Appl. Dec. 19, 1970, 1 claim).*

Smoke ash generated in the copper smelting process is mixed with cement copper, a raw material for copper smelting, and pelletized, so that water content of the cement copper is effectively utilized to prevent possible scattering of the ash. Fine ores, solvent powders, and other impurities contained in the exhaust gas from a melting furnace in the copper smelting process are usually collected by an electrostatic precipitator. The smoke ash so collected is then returned to the melting furnace to recover valuable metals. However, particles of the smoke dust are so small in size and so light in weight that they fly and scatter. This results in lower yield, poor working conditions, and a greater pollution hazard. The cement copper usually comes in a paste form containing 30 40% water content. This cement copper contains little or no sulfur and is therefore suitable for use as a cold charge for the converter. Because of its high water content, however, it is dangerous to feed it into the converter as is. If dried, it is easily blown by the wind pressure of the converter and therefore impossible to process. For these reasons, the cement copper must be processed together with ores in the melting furnace. This method is devised to solve these problems. By mixing the smoke ash with the cement copper and pelletizing the mixture, not only can the scattering of the smoke ash be prevented but also more effective recovery of its valuable contents realized.

36689 **APTIC NO. 59961**

Yamamoto, T.

POLLUTION AND CATALYSTS. *(Kogai to shokubai). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 25(2):233-238, Feb. 1974.*

The role of catalysts in the reduction of air pollution is reviewed. To prevent automotive engine exhausts, nitrogen oxides are reduced to ammonia or nitrogen by carbon monoxide or hydrogen over the catalyst and then CO and hydrocarbons are oxidized by secondary air. Noble metals over ceramic honeycombs are often used. Catalytic combustion for industrial stack gases containing combustible compounds (such as solvents in paint and printing operations) is more satisfactory than scrubbing or activated charcoal adsorption. Catalysts are used to remove NOx from stack gases and to desulfurize heavy oil. By-product recovery of sulfur from hydrogen sulfide-containing stack gases is discussed. The use of catalysts in closed systems is discussed.

36690 **APTIC NO. 59275**

INCINERATION OF TOXIC GASES AND LIQUIDS. *(Incineration de gaz et de liquides toxiques). Text in French. Chim. Actualites, no. 1524:28-29, Feb. 1974.*

Experiments on the destruction of toxic liquids and gases by incineration in a standard Peabody Vortex incinerator are described. Kerosene, toluene, and phenol in methyl alcohol were atomized in a smoke flow produced by a smoke generator to maintain a kerosene, toluene, and phenol concentration of 2000 ppm in the flue gas. Incineration was done by natural gas as auxiliary fuel in a temperature range of 800-1000 C. The heat generated by kerosene, toluene, and phenol during their concentration from 2000 ppm to 5 ppm by incineration was 177 Mcal/h, 237 Mcal/h, and 257 Mcal/h, respectively. After a hold time of 0.395 sec, the phenol concentration was reduced to 1 ppm, and the flue gas contained 7% carbon dioxide, 2 ppm carbon monoxide, and 60 ppm nitrogen oxides. When employing an air excess coefficient of 75%, the NOx emission was reduced to 40 ppm, and practically no CO was emitted. A residue from adipic acid production, containing 17% adipic acid, 53% glutamic acid, 27% succinic acid, and up to 2% water, was incinerated in the same incinerator without auxiliary fuel, using a water vapor atomization burner. The NOx content of the flue gases in the chimney was below 40 ppm.

36691 **APTIC NO. 60114**

ELIMINATION OF ODOUR BY ABSORPTION. *(Geruchsbeseitigung durch Absorption). Text in German. Chem.-Techn. Ind., 70(5):127-128, March 1974.*

The design, application, and operation of a Steuler type absorber for the capillary selective absorption of malodorous components from the air e.g., in animal carcass processing plants are described. The absorber constitutes a tower subdivided into three stages, the first of which serves for the removal of particulate matter and fat and for the humidification of the vent air to be purified. Alkaline wash, possibly with additional oxidizing agent in the second stage, and acid wash, possibly with an additional oxidant in the third stage, are provided. The tower operates on the counterflow principle, with the vent air admitted in the lower part. The absorbing tower contains capillary plates providing for turbulence of the wash liquid over them.

36692 **APTIC NO. 60315**

BLUE FLAME SAVES OIL, CUTS EMISSIONS. *Design Eng. (Canada), 20(1):45, Jan. 1974.*

A combustion system has been developed that burns No. 2 fuel oil with a pure blue flame without producing smoke, odor, or other emissions. It also gives a fuel saving of 15% compared to standard systems. It features up to a 90% reduction in levels of nitrogen oxides. Combustion is achieved by introduction of hydroxylated fuel oil into a combustion air stream. When fuel is hydroxylated, intermediates are formed prior to a complete oxidation to carbon dioxide and water. The absence of free carbon molecules that normally heat to a yellow color explains the blue or nonluminescent flame color. This absence of free carbon also explains the smokeless nature of the system and the low emission rate of unburned hydrocarbons. Burners have been developed ranging from 4 to 20 USGPH (600,000-3,000,000 btu). Test results are given for oil burners and atmospheric gas burners.

1973

36693 **APTIC NO. 59791**

Akutsu, Senji

REMOVAL OF AIR POLLUTION AT A COMPOUND FERTILIZER FACTORY. *(Kasei hiryo kojo ni okeru funjin taisaku no jitsurei). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(11):1141- 1144, Nov. 1973.*

In general, the dust of compound fertilizer factories is produced from cargo handling stages. In most cases, because the dust is highly hygroscopic and the exhaust gas is damp and hot, dust collecting methods have not been firmly established. Cyclonic collection, together with washing, has been the method used, but this has not been efficient. Accordingly, the possibility of using bag filters has been tested, with the result that the process is suitable for all stages of dust removal except those from the dryer and cooler. Thus bag filters were adopted. For the cooler exhaust gas, four filtering rooms where covered with 50 mm thick glass wool and collected dust was discharged using a screw conveyor. The dust was dropped at 20 to 30 min intervals and the stream stopped, counter-pressure applied and shaking commences at the same time.

36694 **APTIC NO. 59592**

Allbritton, William R.

EFFLUENT CLEANER FOR TRASH-BURNING. *(Assignee not given.) U. S. Pat. 3,745,939. 6p., July 17, 1973. 4 refs. (Appl. Nov. 10, 1971, 9 claims).*

An improved apparatus for removing pollutant materials from effluent such as smoke from waste burners and incinerators is described. The apparatus includes a secondary furnace for burning combustible gases and a tortuous horizontal flue, a water pit in a reversing flow path for collecting particles, washing sprays within the water pit and within a discharge stack, and a mechanical filter in the discharge stack. (Author abstract modified)

36695 **APTIC NO. 59346**

Alliger, Howard

AUTO EXHAUST SCRUBBER WITH CATALYST. *(Assignee not given.) U. S. Pat. 3,768,981. 4p., Oct. 30, 1973. 9 refs. (Appl. Feb. 16, 1971, 3 claims).*

An automobile exhaust scrubber/catalyst combination has been developed for reducing the concentrations of noxious components such as lead particles, hydrocarbons, nitrogen, sulfur, and carbon monoxide which commonly are emitted from internal combustion engines. The invention overcomes prior art disadvantages relating to reduction of vehicle efficiency and shortness of scrubber efficiency period by providing an arrangement wherein a pump operating proportionately to the speed of the engine pumps scrubbing liquid from a tank to a filter so as to enable the scrubbing liquid to mingle and be mixed with the gas to be cleaned. The device features the employment of a catalyst which functions as the scrubbing liquid and passes with the gas to be cleaned through the mesh of the filter so as to closely contact and effectively chemically change and entrap the noxious material. The catalyst used may be platinum, alumina, vanadium pentoxide, or manganese dioxide for oxidizing hydrocarbons, nitric oxide to nitrogen dioxide, or carbon monoxide to carbon dioxide. The scrubbing liquid may be an oil or an oil and water emulsion or some other high temperature fluid such as tetraethylene glycol or brake fluid.

36696 **APTIC NO. 59593**

Alms, Erhard E.

ANTI-POLLUTION SCREEN FOR AGRICULTURAL DRYER AND METHOD OF REMOVING POLLUTANTS. *(Assignee not given.) U. S. Pat. 3,747,225. 7p., July 24, 1973. 3 refs. (Appl. Dec. 1, 1971, 12 claims).*

A simple and inexpensive anti-pollution screen and its application for dryers of particulate matter are described. Unlike other systems, it makes use of existing dryer frame members for supporting the screen and takes advantage of the heat produced by the drying operation to prevent sticking of the unwanted particles to the screen. The normal vibration produced in the frame by the fan and burner associated with the dryer shakes down any unwanted particles lodges in the screen. Readily releasable means are provided for removing a portion of all of the screen to gain access to the accumulated unwanted particles at the bottom of the dryer. (Author abstract modified)

36697 **APTIC NO. 59683**

Amaba, Toshio

METHOD TO COMPLETELY RECOVER VANADIUM AND NICKEL FROM SOOTS GENERATED DURING HEAVY OIL COMBUSTION. *(Juyu nensho no sai hassei suru baijin kara banajumu oyobi nikkeru o kanzen ni kaishu suru hoho). Text in Japanese. (Shinko Kagak*

Kogyo Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 48-42765. 3p., Dec. 14, 1973. (Appl. Sept. 21, 1968, 1 claim).

A new method for efficient and economical recovery of nickel and vanadium for soot and dust discharged from dust collectors is described. First water, and then a salt or hydroxide of an alkaline metal or an alkaline earth metal (sodium hydroxide or calcium hydroxide) are added, followed by kneading and baking in a rotary kiln at 100 to 750 C to produce pea-sized briquettes. The NaOH or $Ca(OH)_2$ added serves as a binding and desulfurizing agent. The red-hot briquettes are placed in a fireproof enclosure until they become ash, with their V and Ni concentrated 15 to 25 times. Once cooled, the ash is mixed with sodium carbonate or salt, and water is added to recover the V. The Ni is recovered from the dissolved residue as ferro-nickel or nickel sulfate by means of a dry or wet recovery process.

36698 **APTIC NO. 59691**

Ando, Jumpei

STATUS OF JAPANESE FLUE GAS DESULFURIZATION TECHNOLOGY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 69-101. 5 refs.*

The status of seven Japanese flue gas desulfurization processes is outlined. Process description, developmental and technological status, economics, and advantages and disadvantages are covered for the following: Mitsubishi-JECCO lime (limestone)-gypsum process; Chemico-Mitsui lime process; Chiyoda dilute sulfuric acid process; Wellman-MKK sodium process; Kureha sodium-limestone process; Showa Denko sodium-limestone process; and NKK ammonia process and ammonia-lime process. Most of the desulfurization plants have produced salable by-products such as sodium sulfite, sulfuric acid, and gypsum because Japan is subject to limitations in domestic supply of sulfur and its compounds as well as in land space available for disposal of useless by-products.

36699 **APTIC NO. 59713**

Ando, Jumpei

UTILIZING AND DISPOSING OF SULFUR PRODUCTS FROM FLUE GAS DESULFURIZATION PROCESSES IN JAPAN. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 875- 890. 6 refs. (May 14-17.)*

Desulfurization efforts in Japan are oriented toward processes that yield salable by-products such as sodium sulfite for paper mills, sulfuric acid and sulfur, and gypsum for retarder of cement setting and for gypsum board. This orientation is predicated on the following circumstances: Japan is subject to limitations in domestic supply of sulfur and its compounds as well as in land space available for disposal; most desulfurization plants treat flue gas from oil-fired boilers which contain less dust than does coal-fired flue gas and therefore are suited to the production of by-products of high purity; and most steam power plants are located close to chemical plants. The future supply of by-products is expected, however, to far exceed the demand. Sodium limestone processes recently developed to permit growth of calcium sulfite (which oxidizes to gypsum) to much larger crystals are aiming at solving the problems of excess moisture attendent with its use for land filling. Ammonia scrubbing plants have been shut down because of the oversupply of ammonium sulfate and because double contact processes for the production of acid have been introduced to reduce sulfur dioxide emissions.

36700 **APTIC NO. 59812**

Antro, A. van

CONTROL AND PREDICTION OF EMISSIONS AND POLLUTANT CONCENTRATIONS AROUND A POWER PLANT. *(Controle et prediction des emissions et immissions autour d une centrale electrique). Text in French. Tribune CEBEDEAU (Centre Belge. Etude Doc. Eaux), 26(361):485-497, Dec. 1973.*

General possibilities of the abatement of sulfur dioxide emissions from thermal power plants, and actual measurements of the SO_2 concentrations around power plants in Belgium are described. Flue gas desulfurization, fuel desulfurization, the use of low-sulfur fuels, and appropriate distribution of the available fuels by the use of multi-fuel boilers are the basic possibilities of abating SO_2 emissions from thermal power plants. Thermal power plants equipped with economical SO_2 emission control devices and high stacks should use high-sulfur fuels rather than low-sulfur fuel oils and natural gas. The desulfurizing combustion of fuels in fluidized bed is associated with technological problems not yet solved. Actual measurements of the SO_2 concentrations around major power plants in Belgium are described.

36701 **APTIC NO. 59705**

Anz, B. M., C. C. Thompson, Jr., and J. T. Pinkston

DESIGN AND INSTALLATION OF A PROTOTYPE MAGNESIA SCRUBBING INSTALLATION. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 619-640. (May 14-17.)*

The design and installation of a prototype magnesia scrubbing device for sulfur dioxide removal at Philadelphia Electric s Eddystone No. 1 plant are outlined. Eddystone has a generating capacity of 360 MW, and steam conditions are 5000 psi and 1150 F with two reheats at 1050 F. A fundamental feature of SO_2 scrubbing process is that the chemical compound which reacts in the scrubber to bind the SO_2 is magnesium sulfite. This compound reacts with water and SO_2 to produce magnesium bisulfite ($Mg(HSO_3)_2$). The fundamental chemical reaction which occurs in the scrubber tower results in the conversion of a slightly soluble material to a very soluble material, offering a good possibility of avoiding the problem of plugging in the scrubber tower. The equipment used is a Venturi-Rod unit manufactured by Environeering Inc. There are essentially two scrubbing stages. A slurry of magnesium sulfite in each is sprayed upward, cocurrent with the stack gas, through openings between cylindrical rods. A venturi-like effect similar to a fountain is obtained as the streams flow between these rods, assisting in the contacting between the stack gas and the slurry of magnesium sulfite. Mist is eliminated by the use of backwash sprays of water onto louvers in the top section of the scrubber. Scrubbing efficiency varies from 87% at pH 5 to about 98% at 7.5.

36702 **APTIC NO. 59844**

Arff, John H.

AIR PURIFIER. *(Assignee not given.) U. S. Pat. 3,745,750. 5p., July 17, 1973. 10 refs. (Appl. Jan. 11, 1971, 2 claims).*

An indoor air purifier consisting of an electrostatic filter, an air-treating means, and a charcoal filter has been designed for increased odor removal efficiency as compared with prior art devices relying solely upon charcoal filters. An electrostatic filter is located adjacent the inlet end, and a charcoal filter is positioned adjacent the outlet end. A blower is situated between the inlet and outlet ends for circulating room air through the purifier and subjecting it to the filters. An air treating means, consisting either of an ozone generator or an ultraviolet lamp, is also provided in the purifier for the destruction of bacteria and augmentation of odor removal.

36703 **APTIC NO. 59813**

Asselineau, Pierre

ABATEMENT OF NUISANCES BY THE USE OF LIQUEFIED NATURAL GAS AS AUTOMOBILE FUEL. *(La reduction des nuisances grace a l emploi du gaz naturel liquefie comme carburant automobile). Text in French. Pollut. Atmos. (Paris), 15(60):391-397, Oct.-Dec. 1973.*

The environmental advantages involved in the use of liquefied natural gas as automobile fuel, and related experiments are described. Liquefied natural gas, stored in a double-wall container with vacuum between the wall at -160 C is especially interesting as a fuel for public transportation and utility vehicles in city traffic. Liquefied natural gas has the advantage of containing no sulfur and lead, and of emitting drastically reduced hydrocarbons, carbon monoxide, and nitrogen oxide emissions. The air-excess may be up to 20% higher than in normal gasoline engines. The specific CO, hydrocarbon, and nitrogen oxides emissions from liquefied natural gas-powered vehicles, as measured in the USA, are 1-2.5 g/km, 0.03 g/km, and 0.4-1 g/km. Actual measurements performed on a 130 HP-engines powered with liquefied natural gas revealed 0.15% CO and 10 ppm NOx during start-up; 0.1% C) and up to 100 ppm NOx during idling, and 0.5-1% CO, traces of unburned HC, and 1500-2000 ppm NOx under full load.

36704 **APTIC NO. 59973**

Atsukawa, Masumi

NOX REMOVAL BY THE WET ABSORPTION METHOD. *(Shisshiki kyushuho ni yoru NOx no jokyo). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 18(10):1129-1134, Oct. 1973. 23 refs.*

It is not feasible to scrub less than 500 ppm of nitrogen oxides from the waste gases of stationary sources. The NO is not easily soluble in water and reacts little with alkali. Oxidation, reduction, or some type of catalytic activity must take place to facilitate absorption. Reactions among various NOx and the effects of different oxidizing agents and catalysts are discussed.

36705 **APTIC NO. 59828**

August, Paul

COMBUSTION ENGINE DEVICE. *(Assignee not given.) U. S. Pat. 3,744,249. 7p., July 10, 1973. 18 refs. (Appl. Sept. 16, 1970, 8 claims).*

A device for reducing carbon monoxide and unburned hydrocarbons present in automobile exhaust has been developed to overcome additional air and power loss problems associated with the use of afterburners for such purposes. The device consists of a coaxial annular reaction chamber having a longitudinally arranged heater chamber and an after-combustion chamber having catalytic material therein. A spring-loaded throttle valve is eccentrically mounted within the exhaust system at a position intermediate the ends of the coaxial chamber and is maintained essentially closed until excessively high rates of combustion occur. (Author abstract modified)

36706 **APTIC NO. 59533**

Baldini, B. and P. Colombo

AIR POLLUTION IN KRAFT PULP MILLS. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 599-617, 691-697. 31 refs. (May 7-11.)*

The causes and control of air pollution in kraft pulp mills are discussed. The characteristic odor is caused by hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulifde. The pollution degree can be kept between very narrow limits when particular devices are actuated in order to collect all the reaction products and to send them to treatment plants. Even the recovery boiler can be operated to give SO2 content in fumes lower than 50 mg/cm. The most important problem for the kraft pulp mills is the very low odor threshold of methyl mercaptan. The odor threshold can be situated very near to 0.005 mg/cm and this is not a problem of normal pollution because the dilution of odorous products is extremely high. When all the apparatus of treatment and of recovery work correctly it is possible to reach at the exit from the chimney a concentration of methyl mercaptan lower than 1 mg/cm. If the chimney is correctly placed and if its height has been properly studied in comparison with wind speed, the natural dilution can give at the ground level a methyl mercaptan content lower than the other threshold. (Author conclusions modified)

36707 **APTIC NO. 59881**

Balogh, Andras, Jozsef Herendi, and Jozsef Bathory

CATALYTIC PURIFICATION OF INDUSTRIAL WASTE GASES TO REDUCE ATMOSPHERIC POLLUTION. *(Technologiai veggazok katalitikus tisztitasa a kornyezet vedelmere). Text in Hungarian. Magy. Kem. Lapja (Budapest), 28(11):566-571, 1973 (?).*

At concentrations below the ignition limit, catalytic oxidation is the most effective method of eliminating [illegible] and vapors from chemical plants which are harmful to the environment. Often, noble metals are used as catalysts. However, these are high in price and sensitive to various catalytic poisons. Catalysts consisting of a mixture of metal oxides can be economically applied to various technological processes. Metal oxide catalysts and a temperature of 250-350 C can be used to remove organic impurities such as alcohols, aldehydes, benzene, and phthalates. This was tested in a laboratory and in a pilot plant.

36708 **APTIC NO. 59832**

Barnes, Thomas Donald, Jr.

METHOD AND APPARATUS FOR CUPOLA EMISSION CONTROL. *(Don Barnes Ltd., Hamilton (Ontario)) U. S. Pat. 3,744,215. 8p., July 10, 1973. 7 refs. (Appl. Feb. 25, 1971, 22 claims).*

A constant volume emission control system for cupola furnace systems has been developed with the capability of handling a wide range of temperatures and initial gas volumes coming from the melting zone of the cupola so that absolute temperature control of gases entering the exhaust stack can be achieved. Control with regard to the total volume of gases and air flowing through the system and the ability to provide for an adequate amount of cooling of furnace gases and system components differentiate the present invention from prior art control devices. Opposed side wall portions of a cylindrical cap assembly adapted to be mounted on top of a cupola flue are provided with openings for air inlet and mixture outlet. A fan is situated in the duct leading to the air inlet so that ambient air under positive pressure can be introduced into the cap for dilution and cooling of furnace gases in the cap. The outlet opening is connected to a pair of separator units which are serially arranged between the cap housing and an exhaust stack for the system. An exhaust fan is associated with the output side of the second separator leading to the stack in order to induce flow of furnace gases through the system to the stack. (Author abstract modified)

36709 **APTIC NO. 60219**

Bassa, G.

FLAME STABILITY AND AIR PURITY. *Acta Tech. Acad. Sci. Hung., 75(1-4):13-21, 1973. 8 refs.*

Factors favoring more complete combustion in firing equipment and, hence, a reduction in emissions such as particulates, fly ash, sulfur oxides, nitrogen oxides, and soot are examined in relation to flame stability and air purity. A significant reduction in such emissions can be achieved by ceramic bodies, radiating surfaces, and the application of burners under control within a wide stability range. Surface catalyzers can be used to achieve stabilization, control range extension, and the maintenance of high-efficiency combustion at a reduced temperature level. Burners designed with a ceramic radiation surface exhibit low flame volume, intensive flame radiation, and high uniform thermal load in the chamber. Almost stoichiometric or even vacuum-type firing is feasible without soot and coke production.

36710 **APTIC NO. 59587**

Bayton, Warren C.

ANTI-SMOG DEVICE. *(Assignee not given.) U. S. Pat. 3,743,255. 5p., July 3, 1973. 7 refs. (Appl. April 16, 1971, 6 claims).*

A new and improved fuel mixing device for internal combustion engines is described which provides improved mixing of fuel such as gasoline with air prior to combustion. There is a fuel reservoir designed to fit over the top of a conventional carburetor of an internal combustion engine, after the air filter of the carburetor has been removed. A new type of swirl generating mixing device is included for atomizing and vaporizing fuel such as gasoline into a spray mixture of fuel and air just before combustion of the fuel in the engine, so that substantially complete combustion occurs with a resulting reduction in smog producing compounds being emitted from the engine exhaust. (Author summary modified)

36711 **APTIC NO. 59427**

Beachley, Norman H. and Andrew A. Frank

ELECTRIC AND ELECTRIC-HYBRID CARS -- EVALUATION AND COMPARISON. *SAE (Soc. Automot. Engrs.) Spec. Pub., no. 379:28-35, March 1973. 6 refs.*

The design and operating characteristics of the University of Wisconsin hybrid electric car are described. Thy operating parameters that will give optimum performance have not been finalized. With the hybrid design, it is possible to limit the internal combustion engine operation to conditions of high efficiency. Probably the least attractive part of the concept is the on-board recharging. The overall process of generating electrical power, storing it in the lead-acid battery pack, then using it to run the electric motor, will average only about 40% efficiency. More research is required to develop the hybrid system to its fullest potential and to determine what improvements in fuel economy can actually be obtained with the concept. The hybrid system was designed to be operated under three operating modes -- all-electric, hybrid, and parallel. (Author summary modified)

36712 **APTIC NO. 59553**

Bernert, Juergen

LAW AND TECHNIQUES OF CLEAN AIR MAINTENANCE IN THE TEXTILE INDUSTRY. *(Recht und Technik der Luftreinhaltung in der Textilindustrie). Text in German. Melliand Textilber., 54(3):295-300, 1973. 19 refs.*

Regulations adopted in West Germany concerning emission abatement in the drying operation in the textile industry, and technical possibilities available for compliance with these regulations are described. Waste gases containing organic and malodorous substances from drying equipment with an hourly evaporation capacity of more than 10 kg are required to be cleaned in such a manner that the carbon content in the combustible organic components of the nondiluted waste gas does not exceed 300 mg/n cu m. The chimney should be at least 1.5 m higher than the roof level, and at least 7 m above ground. Drying equipment generated waste gases can be purified by condensation with possible recovery of valuable organic substances. This method is especially suitable for pressured gases and gases of high concentration. While scrubbing is also applicable, drying equipment-generated waste gases, especially those containing malodorous substances, are mostly cleaned through adsorption on activated carbon. Waste gases of low concentration can be purified by thermal afterburning at 800-1000 C, and by catalytic afterburning at 450-500 C.

36713 **APTIC NO. 59538**

Bhatia, S. P., T. De Souza, and S. P. Prahacs

SCRUBBING OF RECOVERY FURNACE STACK GASES WITH ALKALINE SUSPENSIONS OF ACTIVATED CARBON. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 667-697. 2 refs. (May 7-11.)*

Results of laboratory scale scrubbing experiments obtained at two kraft mills using actual recovery furnace flue gases are reported, along with data from some supporting laboratory investigations. In these mill site tests, the alkaline suspensions of activated carbon used reduced odorous sulfur emission by 96-99%. A preliminary cost estimate for scrubbing the recovery furnace flue gases in an existing 500 T/D kraft mill, operating without black liquor oxidation, show a capital cost of $680,000. The total treatment cost, before taxes and without some applicable credits, was estimated at $1.26/ADT of pulp. The net cost of the treatment, still before taxes, but after credits for the additional amounts of salt cake incidentally recovered and hot water produced is likely to range between $0.50 to $1.00/ADT of pulp. There would be added cost of about $0.50/ton of pulp in all cases where the stack gas has to be reheated to maintain an adequate plume height. Pilot scale testing of the proposed technique at a kraft mill of a member company is expected to start during the first half of 1972. (Author abstract)

36714 **APTIC NO. 59720**

Bischoff, W. F.

FW-BF DRY ABSORPTION SYSTEM FOR FLUE GAS CLEAN UP. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73- 038, p. 1081-1100. (May 14-17.)*

The Foster Wheeler-Bergbau-Forschung dry adsorption system for flue gas desulfurization is described. The adsorber consists of parallel louvre beds which support and contain the char during the adsorption phase. The char moves slowly downward in plug flow while the pollutant laden gases pass through the adsorber bed in a cross flow. A fan at the gas discharge of the adsorber is utilized to compensate for pressure losses which occur during the passage of the gas through the bed, and clean gases leaving the fan are directed to the stack for disposal. The char, subsequent to progressing through the adsorber, is taken off and sent to the regeneration section; it is then recycled to the top of the adsorber. Removal efficiencies of 80-95% for SO2, 40-60% for nitrogen oxides, and 90-95% for particulate matter are possible. Two demonstration plants for the system are presently in the design stages. Capital costs in the range of 200 MW vary from $20/KW to $40/KW, while operating costs vary from 80 cents to $2.60/ton depending on the sulfur content in the fuel.

36715 **APTIC NO. 60153**

Borelli, Francisco Burlando

OPEN CYCLE SYSTEMS FOR ELIMINATING DUST, FUMES, AND GASES IN FURNACES. *(Sistemas a ciclo abierto para eliminar polvo, humos y gases en hornos). Text in Spanish. (Ingenieria (Mexico City), no. 4:429-440, Oct.-Dec. 1973.*

A discussion is given of the merits of the venturi tube apparatus in air purification. Among the different systems of purification and elimination of dust, smoke, and noxious fumes and gases applied in foundary furnaces, especially the cupola and electronic models, those employing venturi tubes stand out by viture of their ability to initiate drops in pressure on the flow of the gases in order to properly vary the level of separation and the efficiency. Such systems, particularly those suitable for the iron and steel industry, have apparatus for capturing gases. This apparatus provides an elevated absorption and cooling capacity due to liquid. This same liquid or part of it, can be used in order to accelerate the gases and to favor, through a corresponding fall in pressure, the separation and condensation phase. This function, typical of the venturi tubes, is nourished by liquid, which, after being chemically treated, permits the chemical neutralization of the most contaminating gases such as sulfur dioxide. In general, systems which include anticontamination and purification equipment should contain apparatus for capture, cooling, acceleration, aspiration, and storage.

36716 **APTIC NO. 59721**

Botts, W. V. and R. D. Oldenkamp

THE ATOMICS INTERNATIONAL MOLTEN CARBONATE PROCESS FOR SO2 REMOVAL FROM STACK GASES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 1101-1132. (May 14-17.)*

A molten carbonate process for the removal of sulfur dioxide from stack gases is described along with a pilot plant design for proposed testing of the system. The SO2 removal process uses a molten eutectic mixture of lithium, sodium, and potassium carbonates to scrub a power plant gas stream. The sulfur oxides in the stream react with the molten carbonates to form sulfites and sulfates which remain dissolved in an unreacted excess of carbonate melt. The molten carbonate (sulfite-sulfate) mixture is then regenerated chemically, converting the sulfite and sulfate back to carbonate and recovering the sulfur as hydrogen sulfide. The regenerated carbonate is recirculated to the scrubber to repeat the process cycle, and the hydrogen sulfide is converted to elemental sulfur in a Claus plant. The gas to be treated by the scrubber is removed from the boiler at a temperature above 850 F or is reheated to above that temperature; if the boiler is burning coal, the flue gas is passed through an 850 F, high-efficiency electrostatic precipitator for removal of fly ash. A pilot plant is underway for treating a side stream of 20,000 scfm flue gas from an oil-fired steam generator.

36717 **APTIC NO. 60062**

Braun, Paul E. and Ernest J. Obermeyer

CARBURETOR EMISSION CONTROL. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,744,471. 5p., July 10, 1973. 3 refs. (Appl. Nov. 29, 1971, 5 claims).*

A carburetor emission control system has been designed to provide a carburetor with a throttle valve positioner that will automatically position the throttle valve for engine start and idle speed operations and that will prevent engine dieseling upon engine shutdown to minimize the passage of unburned hydrocarbons into the exhaust system and atmosphere. The minimum flow and engine idle speed positions of the throttle valve in prior art devices have usually been the same. A manifold vacuum controlled servo normally positions the carburetor throttle valve of the present invention to an engine idle speed and start position. The servo has a vacuum reservoir, and the vacuum line has an engine ignition system controlled vent valve so that upon engine ignition shutoff the vent valve immediately connects the vacuum line to atmospheric pressure prior to the natural bleeddown of the manifold vacuum to atmospheric pressure. Hence, the reservoir vacuum is permitted to effect closing of the throttle valve for prevention of engine dieseling and attendant emissions. (Author abstract modified)

36718 **APTIC NO. 59992**

Brechtel, Heinz

THE DEVELOPMENT OF WATER PURIFICATION AND SLUDGE TREATMENT IN THE CITY GEISLINGEN AN DER STEIGE, WITH SPECIAL REGARD TO INDUSTRIAL WASTE WATER. *(Die Entwicklung der Abwasserreinigung und der Schlammbehandlung der Stadt Geislingen an der Steige, unter besonderer Beruecksichtigung der Industrieabwaesser). Text in German. Industrieabwaesser, 1973:1-8, 1973.*

The historical development of the water purification plant in Geislingen an der Steige is described. The present facilities were designed in 1961 and consist of a mechanical purification, biological purification, and chemical purification state, since the communal waste water also carries waste from the city s metallurgical industries. After mechanical purification and biological purification with activated sludge, the waste water goes to a cyclator where it is mixed with aluminum sulfate. After chemical conditioning, the accumulated sludge is dehydrated in a chamber filter press. The dehydrated sludge is incinerated in a story furnace. The stack gases are cleaned in a jet scrubber to remove dust. Despite this treatment, odors contaminate the neighborhood during temperature inversions. This necessitates construction of a thermal afterburner.

36719 **APTIC NO. 60167**

Brink, David L. and Jerome F. Thomas

METHOD AND APPARATUS FOR THE DESTRUCTIVE DECOMPOSITION OF ORGANIC WASTES WITHOUT AIR POLLUTION AND WITH RECOVERY OF CHEMICAL BYPRODUCTS. *(California Univ., Berkeley) U. S. Pat. 3,761,568. 10p., Sept. 25, 1973. 4 refs. (Appl. Feb. 16, 1971, 18 claims).*

Organic material, such as kraft black liquor, wood residues, organic fuels, and garbage can be destructively distilled and pyrolyzed at elevated temperatures and for a time sufficient to break the material down to noncombustible solids and a stable, clean-burning gaseous fuel. These distillation and pyrolysis steps can be effected in a single stage or preferably in successive stages. Valuable organic products can be recovered from the first stage effluent by condensation or by other means. The temperature during pyrolysis is high enough to preclude undesirable recombination of intermediate products to compounds which would otherwise pollute the atmosphere. A controlled amount of oxygen, which can take the form of malodorous emission gases such as those obtained during operation of a kraft mill or other industrial plant, is continuously introduced during pyrolysis to provide energy by exothermic oxidative reactions. The oxygen is insufficient to effect stoichiometric, complete combustion, however. The content of water vapor in the pyrolysis zone where cracking occurs is maintained at a high enough level to insure that carbon particles in the zone react with water to form hydrogen and carbon monoxide. (Author abstract modified)

36720 **APTIC NO. 59838**

Burden, Roy B., Jr. and Ernest J. O Gieblyn

HEATING AND EXHAUST EMISSION CONTROL SYSTEM AND METHOD FOR MATERIAL DRYERS. *(Wasteco, Inc., Tualatin, Oreg.) U. S. Pat. 3,749,030. 4p., July 31, 1973. 3 refs. (Appl. Nov. 8, 1971, 2 claims).*

An incinerator-dryer combination has been developed for the control of gaseous and particulate exhaust emissions from material dryers as well as for the recovery of heat for such dryers. Heat generated within an incinerator is transferred to oil in a combustion gas-to-oil heat exchanger, and the hot oil is circulated through a radiator in a material dryer to heat air used in the drying medium. The hot air passing in contact with material to be dried picks up particulates and gases which are then conducted to the combustion chamber of the incinerator for burning as a source of heat for the dryer. (Author abstract modified)

36721 **APTIC NO. 59839**

Burden, Roy B., Jr.

CONTROLLED ATMOSPHERE INCINERATOR. *(Wasteco, Inc., Tualatin, Oreg.) U. S. Pat. 3,749,031. 5p., July 31, 1973. 2 refs. (Appl. Nov. 8, 1971, 15 claims).*

A controlled atmosphere incinerator for the incinerating of solid wastes at a uniform, controlled rate while minimizing exhaust pollutants has been developed to overcome prior art deficiencies such as incomplete and uncontrolled combustion, inefficiency, and air pollution problems. The combustible materials are burned within a primary combustion chamber in a controlled atmosphere consisting primarily of a large proportion of carbon dioxide and a smaller proportion of air. The controlled atmosphere is produced by afterburning the combustion gases from the primary burner in the presence of combustion air and then recirculating the hot afterburned gases mixed with controlled amounts of air back to the primary combustion chamber. The temperature and rate of burning in the primary chamber can be carefully regulated by controlling the proportionate amounts of CO2 and air in the mixture. (Author abstract modified)

36722 **APTIC NO. 59772**

Canonne, A. and J. L. Reneaut

PROBLEMS CAUSED BY BLACK LIQUOR OXIDATION. *(Problemes occasionnes par l oxidation de la liqueur noire). Text in French. Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, Italy, 1973, p. 619-632. 5 refs. (May 7-11.)*

Black liquor oxidation and scrubbing techniques adopted by the Cellulose d Aquitaine is described. The black liquor is oxidized in two towers with asbestos cement plates, where also partial absorption of the malodorous gases occurs. This system permits reduction of the quantity of the gaseous sulfurous compounds emitted by the cascade evaporator by 90%. The gases leaving the towers are cleaned in a scrubber with chlorine-containing waste liquid from the bleaching operation. The combined efficiency of the washing towers and the scrubber amounts to 60-70%, depending on the amount of chlorine.

36723 **APTIC NO. 59757**

Chasse, James P.

STAFF REPORT ON COAL GASIFICATION: PROCESSES AND EFFECTS. *Preprint, National Environmental Research Center, Corvallis, Wash., Pacific Northwest Environmental Research Lab., 29p., Oct. 1973. 12 refs.*

Plant requirements and problems associated with coal gasification processes are reviewed and compared to conventional power generation sources in terms of efficiency and pollution impact. Processes for achieving high-Btu gas from coal include: the HYGAS process, BI-GAS process, Carbon dioxide-Acceptor process, the Synthane process, and the Lurgi process. The conversion of coal to high-Btu gas is only about 65% thermally efficient with a heat rejection rate of 4-6 times 10 to the 9 Btu/hr, and available literature is not specific as to how much of this will be released directly through the process and stacks and how much must be accommodated by the primary cooling device. Air pollution should not be a problem since the gasification process is conducted in closed vessels and the gases go through extensive washing and purification. Potential trace pollutants which might present problems after plant start-up include: carbonyl sulfide, oxides of nitrogen, mercaptans, and aromatics in addition to the large quantities of carbon dioxide released through the stacks. Basic techniques for the manufacture of low-Btu gas are well established, and problems associated with air pollution may be significantly less than those associated with conventional plants. Combined-cycle stations also appear to offer potential for reducing NOx emissions.

36724 **APTIC NO. 59840**

Chiang, Ta-Kuan

ELECTROSTATIC PRECIPITATOR. *(Assignee not given.) U. S. Pat. 3,747,299. 7p., July 24, 1973. (Appl. Feb. 4, 1972, 16 claims).*

An electrostatic precipitator has been designed for more efficient precipitation via reduction of particulate reentrainment; it differs from prior art systems by having three separate functional stages, viz., a particle pre-charging section, a particle charging section, and a particle collection section. The particles entrained in a gas stream are first electrically pre-charged by induction and conduction from a closed and non-emitting electrode configuration and then further charged toward their saturation charge in an optimized particle charging section by a corona field charging mechanism. They are finally collected in an optimized precipitation field. A confined electric wind turbulence is provided at the collection plates together with ion showers of the same polarity as that of the charged particles in order to retain the collected particles. Particle reentrainment even during mechanical dislodgement is eliminated by the effective use of turbulence mixing and diffusion of the confined electric wind near the collection wall and is further assured by the recharging and recollection of particles by the ion showers in an optimized precipitation field. (Author abstract modified)

36725 **APTIC NO. 59594**

Ciraolo, Samuel

POLLUTION PREVENTING EXHAUST DEVICE. *(Assignee not given.) U. S. Pat. 3,747,347. 4p., July 24, 1973. 6 refs. (Appl. April 12, 1971, 7 claims).*

A muffler separator connected to the exhaust pipe of an engine is described. It includes a tubular elongated casing divided into chambers by baffles extended alternately from opposite walls of the casing leaving a space at the free edge of each baffle for the passage of products of combustion from chamber to chamber. The baffles are parallel and are inclined toward the intake end of the casing. The volume of the chamber at the intake end is about three times the combined volume of all the combustion chambers of the engine. The volume in each intermediate chamber is about the same as that of a single combustion changer in the engine. The volume of the chambers nearer the exhaust end of the casing increases gradually. A trap underneath the casing collects trapped moisture which can be reintroduced into the engine. The baffles direct the flow of fumes from the engine and impingement on the baffles causes deposition of fuel droplets which are then collected and drained. (Author abstract modified)

36726 **APTIC NO. 59849**

Clarke, A. J.

BEST PRACTICABLE MEANS OF REDUCING EMISSIONS TO THE AIR IN THE ELECTRICAL POWER INDUSTRY. *Chem. Eng., 9(271):130-142, 150, March 1973. 4 refs.*

The best practicable means approach to air pollution control is an interesting alternative to control by legal numerical standards. In Britain, the approach has demonstrably worked to the benefit of cleaner air without imposing crippling financial burdens on industry. Control of smoke emissions under the 1956 Clean Air Act is an example of control by standards (Ringelmann Number), but the 1968 Clean Air Act brought smoke emissions from power stations back into the sphere of best practicable means. Grit and dust emission control from coal-fired power stations involves both prevention of emissions by means of an arrestor plant and dispersion through tall stacks of residual particulates. The best practicable means for modern coal-fired stations requires electrostatic precipitators of 99.3% efficiency, while a solids burden of less than 0.46 g/cu m applies to older plants. The best practicable means for sulfur dioxide emission control remains tall stacks dispersion. Although gas washing process achieve high SO2 removal at an acceptable cost, they produce wet chimney plumes and can contribute to water pollution.

36727 ***APTIC NO. 59341***

Courbon, Paul

APPARATUS FOR THE SUCTION AND PURIFICATION OF POLLUTED AIR. (Charbonnages De France, Paris (France)) U. S. Pat. 3,765,155. 9p., Oct. 16, 1973. 19 refs. (Appl. April 6, 1970, 15 claims).

A radial fan apparatus for the suction and purification of particulate-laden air has been developed to act either as an air purifier or as a dust sampler which eliminates the need for preliminary size sorting associated with prior devices of its kind. A thick filter is held in a cup with a cylindrical edge and rotates about a vertical axis, having its opening directed downwards; while a cyclone separator with at least one tangential inlet is fixed in an air-tight and removable manner under the lower wall of the sampling chamber with its transfer tube directed upwards so as to form the suction orifice of the sampling chamber. Peripheral evacuation orifices are disposed tangentially with respect to the cylindrical wall of the sampling chamber and in the direction of rotation of the thick rotor. The sections of the suction orifice, the evacuation orifices, and the sampling chamber have values such that the suction flow is less than the actual flow rate of the radial fan.

36728 **APTIC NO. 59754**

Craig, John M., John K. Carpenter, James H. Carson, John H. McCarthy, Sam Ruggeri, O. R. Tattoli, D. W. Tschappat, and Keith H. Workman

REPORT OF EDISON ELECTRIC INSTITUTE STUDY GROUP ON SO2 REMOVAL PROCESSES IN JAPANESE PLANTS. *Edison Electric Inst., New York, July 1973, 89p. 2 refs.*

A number of Japanese flue gas desulfurization processes were observed and reviewed by an Edison Electric Institute Study Group in an effort to assess their status of development and to determine the applicability of these flue gas desulfurization processes to American electric utility boilers. The group did not observe a single case of an installation or process which could be considered to be demonstrated based on the guidelines established by the National Academy of Engineering Ad Hoc Panel on Control of Sulfur Dioxide from Stationary Combustion Sources. The Japanese are taking full advantage of the opportunity to burn low sulfur oils and the utilization of tall stacks as an accepted and widely practiced control technique. Development of flue gas desulfurization technology, however, is proceeding in an orderly, well-planned manner. Process descriptions, flow diagrams, and operating and design parameters are given for each installation visited.

36729 **APTIC NO. 59279**

Cueto, Jose Maluquer

AIR POLLUTION GENERATED BY MOTOR VEHICLES AND ITS ABATEMTNT. *(La contaminacion atmosferica por los vehiculos y su correccion). Text in Spanish. Ion (Madrid), 33(389):388-392, Dec. 1973. 7 refs.*

General problems of motor vehicle-generated exhaust emissions, and of catalytic exhaust control devices are discussed. In Europe, the exhaust carbon monoxide emission is limited to 4.5% for new vehicles, and to 5.5% for used ones with spark ignition engines. The limits proposed for the hydrocarbon, CO, and nitrogen oxides emissions in the USA by 1975 are 50 ppm, 0.5%, and 250 ppm. The production of CO and HC is conditioned by the quality of carburetion, turbulence, injection, ignition, and compression. The composition of the gasoline has little influence on the HC emissions. The NOx emissions can be effectively reduced by exhaust gas recirculation. Reduction of NOx and oxidation of CO and HC is possible by means of catalytic exhaust control devices at temperatures of 300-400 C. However, the life of such catalysts is sharply reduced proportional to the lead content of the gasoline. The catalyst can be protected by the use of lead bromide which, being volatile, decomposes before reaching the exhaust control device.

36730 **APTIC NO. 59834**

Davis, John Derek

METHOD AND MEANS FOR REDUCING EXHAUST SMOKE IN I.C. ENGINES. *(Ricardo and Co., Engineers (1927) Ltd., Sussex (England)) U. S. Pat. 3,744,461. 8p., July 10, 1973. 4 refs. (Appl. Sept. 3, 1971, 7 claims).*

A device for reducing exhaust smoke density for liquid fuel-injected diesel internal combustion engines is described. An electrode assembly mounted in the exhaust duct and insulated therefrom receives an electrical charge from the charged carbon smoke particles impinging upon it, and the resultant potential is supplied to an electrohydraulic control circuit which activates a hydraulic plunger comprising an adjustable stop for limiting the maximum quantity of fuel delivered to the engine. Hence, an automatic reduction of maximum fuel delivery is achieved in response to the occurrence of an increase in smoke density of the exhaust. (Author abstract modified)

36731 **APTIC NO. 59860**

deSeversky, Alexander P.

LIQUID DISTRIBUTORS FOR WET ELECTROSTATIC PRECIPITATORS. *(Seversky Electronatom Corp., New York) U. S. Pat. 3,742,681. 11p., July 3, 1973. 10 refs. (Appl. July 25, 1972, 7 claims).*

An improved liquid distributor for a wet electrostatic precipitator having at least one annular passage defined by concentrically-arranged inner and outer collector tubes is described. The distributor is designed to produce downflowing uniform films of liquid on the surfaces of the collector tubes which line the annular passage of the precipitator such that the films are free of dry spots or splashing, thus enhancing operation efficiency. The liquid distributor includes an annular ring secured to the upper end of the collector tube, with the interior of the ring being hollow to define a main tank for holding liquid fed to it. The ring is provided with inclined openings to discharge liquid from the tank onto the inner and outer walls for the generation of a swirling motion. Means are also provided for the compensation of centrifugal forces created by the swirling motion to prevent liquid from peeling off the outer wall.

36732 **APTIC NO. 59422**

Domon, Toru

THE PRESENT SITUATION AND THE PROBLEM ABOUT THE ODOR POLLUTION IN JAPAN. *(Akushu kogai no kenkyo to mondaiten). Text in Japanese. Koryo (Aromatics), no. 104:11-18, June 1973. 4 refs.*

The characteristics of bad odors, the mechanism of human olfactory sensitivity, the intensity of odor and threshold, bad odors designated by law, environmental standard concentrations, intensity of odors and degree of unpleasantness, the main sources of bad odors in Japan, and deodorization methods are discussed. The threshold concentration (intensity 2.5) for ammonia is 1 ppm, methyl mercaptan, 0.002 ppm, hydrogen sulfide, 0.02 ppm, methyl sulfide, 0.01 ppm, and trimethyl amine, 0.005; easily detectable odor concentrations are, in the same order, 2 ppm, 0.004, 0.06, 0.05, and 0.02; easily detectable to strong odor (intensity 3.5) are, in the same order, 5 ppm, 0.01, 0.2, 0.2, and 0.07 ppm respectively. The characteristics of various deodorization methods are as follows: the water scrubbing method is inefficient unless water-gas contact is good; acid-alkaline scrubbing requires treatment of waste acid and alkali; the cooling method requires the treatment of exhaust gas when odor intensity is high, therefore, it is usually combined with combustion; dilution does not change the unit quantity of odor and therefore it is not suitable for industrial areas in Japan; adsorption requires effective recovery methods for activated carbon; ozone is ineffective for ammonia, and for other odors, the quantity must be adjusted according to the type of odor; chlorine treatment is mainly effective for sulfur odors, and must not be used in excess; combustion requires high temperature (above 800 C) and water in gas must be eliminated first; catalytic combustion requires preheating of gas to 250-350 C, the catalyst must be checked for effectiveness, and the gas concentration must be maintained below explosion point; biochemical degradation requires further study on the treatment capacities of fungi; neutralization and masking are applicable to all types of odors if concentrations are not high, but the cost is relatively high.

36733 APTIC NO. 59718

Draemel, Dean

AN EPA OVERVIEW OF SODIUM-BASED DOUBLE ALKALI PROCESSES. PART I. A VIEW OF THE PROCESS CHEMISTRY OF IDENTIFIABLE AND ATTRACTIVE SCHEMES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 997-1018. 4 refs. (May 14-17.)*

The process chemistry of double alkali scrubbing is presented, and five double alkali operating schemes are outlined. Sulfur oxides are absorbed into a sulfite/bisulfite buffer solution, shifting the pH down and increasing the bisulfite concentration. The liquor from the scrubber may then be treated with limestone to precipitate calcium sulfite and neutralize the bisulfite, and the liquor from the scrubber or the limestone reaction vessel may be treated with lime to precipitate calcium sulfite and possibly calcium sulfate. The oxidation of absorbed sulfur requires the regeneration of sulfate. Calcium ion concentrations in the scrubber can be controlled by softening steps in the liquor loop. Five relatively distinct modes of operation have been identified: limestone and lime regeneration, dilute active alkali, with sulfite softening; lime regeneration, dilute active alkali, with sulfite softening; lime regeneration, concentrated active alkali, with side stream sulfate treatment; limestone regeneration, concentrated active alkali, with side stream sulfate treatment; and lime regeneration, dilute active alkali, with carbonate softening.

36734 APTIC NO. 60207

Dunn, John

GAS WASHING APPARATUS. *(Peabody Engineering Corp., New York) U. S. Pat. 3,756,580. 6p., Sept. 4, 1973. 11 refs. (Appl. Jan. 31, 1972, 12 claims).*

A gas washing apparatus is described which includes an inlet duct with its discharge end submerged in a liquid. It has peripheral openings below the level of the liquid which are adapted to be exposed by the depression of the liquid level within the duct due to the gas pressure. Flared vanes extend outwardly from the openings into the liquid to form a venturi effect. The discharged gases bubble upwardly through the liquid and are passed through a drying apparatus for the removal of the entrained liquid droplets. The invention is a novel and improved apparatus which uses the kinetic energy of the gas and of the entrained particles to effect their efficient removal. The gas velocity remains substantially the same, regardless of changes in gas volume. (Author abstract modified)

36735 APTIC NO. 60197

Durrant, Oliver W.

SYSTEM FOR CONTROLLING THE INJECTION OF AN INERT GAS INTO THE AIR SUPPLIED A BURNER TO INHIBIT THE FORMATION OF NOX. *(Babcock and Wilcox Co., New York) U. S. Pat. 3,760,776. 8p., Sept. 25, 1973. 3 refs. (Appl. Dec. 16, 1971, 10 claims).*

A combustion control system for a vapor generator in which flue gas is recirculated to the furnace to control reheat temperature is described. A controlled portion of the recirculated gas is injected into the air supplied the burners to inhibit the formation of nitrogen oxides. The invention provides a control system which maintains the required flow of recirculated gas with minimum power consumption and maximum efficiency. (Author abstract modified)

36736 APTIC NO. 59824

Ebert, Paul

APPARATUS FOR CLEANING GASES THROUGH IONIZATION. *(Aeropur, A.G., Zug (Switzerland)) U. S. Pat. 3,744,218. 5p., July 10, 1973. 8 refs. (Appl. April 13, 1971, 9 claims).*

An electrostatic precipitator for mounting inside a chimney flue and separating gases such as sulfur dioxide and sulfur trioxide contained in stack emissions has been designed with a relatively short and more reliable high voltage supply line than similar prior art devices have demonstrated. The device is capable of operating with voltages of at least 100 kv. The high voltage generator is installed in a stationary insulator within the chimney flue, and the stationary insulator supports a carrying axle which has direct electrical contact with the high voltage generator output and which carries a number of hollow high potential discharge electrodes. The chimney flue serves as a discharge channel in which a collecting electrode is provided in the form of a continuous film of water flowing down along the inside walls of the flue. (Author abstract modified)

36737 APTIC NO. 59825

Ebert, Paul

HIGH-VOLTAGE OZONE-FREE ELECTROSTATIC AIR FILTER. *(Aeropur, A.G., Zug (Switzerland)) U. S. Pat. 3,744,217. 5p., July 10, 1973. 7 refs. (Appl. Dec. 23, 1970, 6 claims).*

An ozone-free electrostatic air filter for the removal of odors, particulates, and microorganisms from indoor environments has been designed to operate with high voltages (20 100 KV) previously not employed in air-conditioning equipment. The advantage of the high voltage consists in the rapid and intensive ionization of the above air contaminants. The time that the air is exposed to the electric field can be greatly reduced as well as the size of the apparatus. The electrode is suspended in a duct through which air is drawn by a fan. Spaced fins having serrated edges which face laterally in opposite directions toward the walls of the duct characterize the end of the electrode which is adjacent the inlet opening of the duct. The duct walls are covered with a continuous liquid flow (referred to as the separator electrode). The toothlike projections of each serrated edge (referred to as the spray electrodes) are staggered vertically and thus produce a strong ionization with spray discharge. A second part of the electrode consists of a smooth plate of the same polarity as the spray electrode; the distance to the separator electrode, however, is smaller. Ozone is thus not produced in the second part of the apparatus, and that produced initially is absorbed into the water. A filter of active carbon is installed between the electrode and the fan adjacent the outlet of the shaft to absorb the last remaining residue of possibly accruing ozone.

36738 APTIC NO. 59837

Ehrlichmann, Merlin W. and John R. Bjorklund, Jr.

SMOKE CONTROL DEVICE. *(West Creek Co., Inc., Minnetonka, Minn.) U. S. Pat. 3,749,032. 4p., July 31, 1973. 3 refs. (Appl. April 24, 1972, 7 claims).*

A smoke control device for connection to the output of conventional incinerators which presently fail to provide adjustable means for achieving complete combustion has been designed. The device consists of an afterburner which includes an adjustable baffle that permits variation of the combustion chamber size for insuring complete combustion. The baffle also insures that the downstream temperatures from the combustion chamber are maintained at a low enough level to meet existing standards. The chamber discharges past the baffle into the atmosphere. The burner or heat source may be of any conventional design utilizing natural gas.

36739 **APTIC NO. 59694**

Elder, H. W., L. Sybert, J. E. Williams, and P. E. Stone

OPERABILITY AND RELIABILITY OF EPA LIME/LIMESTONE SCRUBBING TEST FACILITY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 333-356. (May 14-17.)*

An experimental test facility at the Tennessee Valley Authority s Shawnee station was designed and constructed by the Environmental Protection Agency to study and evaluate the feasibility and economics of closed-loop lime/limestone wet-scrubbing processes. Operability and reliability data led to the following recommendations: automatic control of limestone feed rate to maintain pH at values below 6.0 appears feasible if reliable pH meter operation can be established; a venturi scrubber may be the most effective device for addition of the liquor when gas cooling by humidification ahead of the absorber is required; precipitation on mist eliminator surfaces can be controlled by dilution of clarified liquor with available makeup water; use of an external combustion system and admixture of completed burned combustion products with the scrubber exhaust gas would be a more satisfactory system for direct-fired reheat; clarifiers appear to be underdesigned to provide both a dense underflow (40% solids) and a clear overflow; a nonplugging probe for sulfur dioxide analyzers is needed as well as heated, well-insulated sample lines; and rubber lining of scrubbers, tanks, pumps, and piping has been entirely satisfactory.

36740 **APTIC NO. 59677**

Enomoto, Kazuo

DRYING DEVICE FOR DOMESTIC ANIMAL EXCREMENT. *(Chikufun kanso sochi). Text in Japanese. (Nomura, K. and Y. Furuta, Yokohama (Japan)) Japan. Pat. Sho 48-36541. 3p., Nov. 5, 1973. (Appl. Dec. 4, 1970, 1 claim).*

This device, which additionally functions as a cyclone, consists of a rotary fermentation tank and a dryer tank. When a day volume chicken excrement is put into the rotary fermentation tank with its switch turned on, for example, the tank starts to rotate slowly at 8-10 rpm. Water content of the raw excrement is about 80%. A burner is then fired to heat fresh air which is fed into the rotary tank and dries the excrement to reduce its water content to about 30% in 24 hr. The excrement is then transferred to the dryer tank in which the water content is reduced to 10-15%. This dried excrement makes a good quality fertilizer. The hot gas containing fine dust particulates generated during the drying process is led through a pipe for cooling and liquefication. Water moisture and ammonia gas contained in the hot gas are thus liquefied, and absorb the fine dust particulates generated by stirring during the drying process.

36741 **APTIC NO. 59693**

Epstein, M., C. C. Leivo, C. H. Rowland, and S. C. Wang

TEST RESULTS FROM THE EPA LIME/LIMESTONE SCRUBBING TEST FACILITY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 235-332. 12 refs. (May 14-17.)*

Test results are given for three parallel scrubber systems, each with its own slurry handling system, which were installed by the Environmental Protection Agency at the Tennessee Valley Authority s Shawnee coal-fired boiler No. 10 which burns a high bituminous coal leading to sulfur dioxide concentrations of 2300-3300 ppm and inlet grain loadings of about 2-6 grains/scf in the flue gas. The following scrubbers were selected and tested based on their ability to handle slurries without plugging or excessive pressure drop and on their reasonable cost and maintenance: venturi followed by a spray-tower; turbulent contact absorber; and marble bed absorber (Hydro-Filter). Tabular and graphical results are given for the effects of various operating and process parameters on SO2 and particulate removal rates and efficiencies. Some results from a scrubber simulation model are also provided.

36742 **APTIC NO. 60319**

Epstein, Michael, Louis Sybert, and Irwin A. Raben

EPA ALKALI SCRUBBING TEST FACILITY: SODIUM CARBONATE AND LIMESTONE TEST RESULTS (FINAL REPORT). *Bechtel Corp., San Francisco, Calif., Environmental Protection Agency Contract PH 22-68-67, Program Element 1A2013, EPA-650/2-73-013, 259p., Aug. 1973. 24 refs.*

NTIS: PB-225041/3 AS

Initial results of testing a prototype wet lime/limestone scrubbing facility for removing sulfur dioxide and particulates from flue gases are described. The facility consists of three parallel scrubbers, a venturi/spray tower, a Turbulent Contact Absorber (TCA), and a marble-bed scrubber, each able to treat a 10-Mw equivalent (30,000 acfm) of flue gas from a coal fired boiler at TVA s Shawnee Station. Sodium carbonate tests were completed in July 1972. As of June 1973, short term (less than 1 day) limestone factorial tests were essentially complete and longer term (2+ week) reliability verification tests were 50% complete. Long term (4-10 month) limestone tests and initial lime tests are scheduled to begin Sept. 1973. The short term limestone tests, conducted at high scrubber inlet liquor pH (6.0-6.2) saw SO2 removals of 80% (venturi/spray tower and marble bed scrubber) to 96% (TCA). Initial longer term tests were run at reduced stoichiometries to increase system reliability and limestone utilization. For the TCA, limestone utilization was 83% with SO2 removal of 80-85%. Operability and reliability of the scrubbers for these tests were good. (Author abstract modified)

36743 **APTIC NO. 60196**

Evanshen, John

POLLUTION CONTROL. *(Teep Toxic Control Ltd., Montreal (Quebec)) U. S. Pat. 3,757,489. 5p., Sept. 11, 1973. 13 refs. (Appl. Dec. 4, 1970, 6 claims).*

Environmental pollutants are treated by bringing them into contact with polyvinylpyrrolidone. This substance is composed with a carrier material, preferably vermiculite. The composition may contain a nitrate of sulfate of copper or silver. Desirably, the composition is in the form of a self-supporting plaque which can form part of a pollution-control device. A preferred use of the invention is in treating gases resulting from the combustion of fuel. Devices are described in which exhaust gases go through a passage in which they contact successive baffle members surfaced with the pollutant-arresting material. This method can be used to prevent pollution from hot exhaust gases from internal combustion engines and from smokestacks. (Author abstract modified)

36744 **APTIC NO. 60206**

Fish, William M.

ANTI-POLLUTION METHOD. *(Aluminum Co. of America, Pittsburgh, Pa.) U. S. Pat. 3,760,565. 4p., Sept. 25, 1973. 4 refs. (Appl. July 19, 1971, 7 claims).*

Removal of fluoride from a stream of gas contaminated with fluoride is described. Fluoride is adsorbed on alumina moving in the same direction and in contact therewith for not exceeding 20 sec. This method can be used to remove fluorides such as hydrogen fluoride from various off gases such as off gas from electrolytic cells used in production of aluminum by electrolysis of alumina. This invention is less costly and more efficient than previous methods using static and fluidized beds of alumina, since it requires a shorter contact time between alumina and fluoride. Alumina used in removal of fluoride from off gas from electrolytic production of aluminum can be used as alumina to be electrolyzed in one or more cells, resulting in a highly economical use of alumina. (Author abstract modified)

36745 **APTIC NO. 60071**

Fisher, John H.

PROCESS FOR SIMULTANEOUS TURPENTINE RECOVERY AND ODOR CONTROL. *(British Columbia Forest Products Ltd., Vancouver, (British Columbia)) U. S. Pat. 3,745,063. 7p., July 10, 1973. 6 refs. (Appl. Nov. 1, 1971, 13 claims).*

A process for simultaneous turpentine recovery and odor control of vaporous relief gases from flashers, evaporators and chip preheaters used in the kraft pulping processes has been developed to achieve a higher percentage of recovery and odor destruction than prior art systems and to do so in a less complex manner. The relief gases from the flashers and chip preheaters are directed to a digester condenser, while the gases from the evaporators are directed to a condensing apparatus. The former are partially condensed in the digester condenser, and the condensate is combined with part or all of the condensate from the evaporator condensing apparatus. Both of these are then directed to a steam stripper. The uncondensed gases from the digester condenser are conducted to the condensing system of the stripper where these gases are condensed together with vaporous gases arising from the stripper. Subsequent to this simultaneous condensation of the two sources of gas, the turpentine is recovered; and the odorous foul gases are directed to equipment for their destruction together with uncondensed gases from the evaporator condensing apparatus. (Author abstract modified)

36746 **APTIC NO. 59877**

Florentine, Frederick W.

FUEL CONVERTER. *(Assignee not given.) U. S. Pat. 3,743,258. 10p., July 3, 1973. 14 refs. (Appl. Nov. 3, 1971, 10 claims).*

A converter for supplying a combustible mixture of air and a gaseous fuel to an internal combustion engine is described. The converter replaces a conventional carburetor. The converter supplies a mixture of gaseous fuel and air which burns more efficiently and completely, and thus reduces contamination in engine exhaust which causes pollution of the atmosphere. The converter may be employed in engines of various types including automotive and aircraft engines using evaporable fuels such as gasoline, kerosene, alcohol, or diesel fuel. The converter comprises a venturi device with an inlet connected to an air filter and an outlet connected to an intake manifold of an internal combustion engine. A throttle plate located between the venturi and the filter contains a main throttle valve which controls the supply of air to the venturi device and a second throttle valve which controls the supply of a mixture of gaseous fuel and air to the venturi. For idle and low speed operation, the mixture of fuel and air is admitted through the second throttle valve. For increased speed and power, air is admitted through the main throttle valve and liquid fuel is supplied to a roughened and heated interior surface of a center of the venturi device. A film of the liquid fuel spreads over the interior of the venturi center and is evaporated quickly into gas which mixes with air. The amount of liquid fuel supplied is controlled by a needle valve which is set by a monitoring device in conjunction with the amount of warm turbulent air entering the venturi, so that the proper mixture of gas and air is obtained in accordance with the power required by the engine. (Author abstract modified)

36747 **APTIC NO. 59991**

Fortnagel, M.

DIESEL ENGINES WITH LOW POLLUTANT EMISSION. *(Dieselmotoren mit geringer Schadstoffemission). Text in German. Umschau Wiss. Tech., 73(23):736-737, 1973. 4 refs.*

The turbocharged indirect injection engine offers an alternative for the passenger car. Low carbon monoxide and hydrocarbon emissions are combined with low nitrogen oxide emissions that can be further reduced by retarded injection and exhaust gas recirculation (EGR). Exhaust gas recirculation also gives remarkable reduction in direct injection diesel emissions. A graph illustrates the reduction of pollutant emission (as measured by the 13-mode California test) that can be achieved through turbocharging and EGR in direct injection diesel engines, and compares it with the emissions of Otto engines.

36748 **APTIC NO. 59719**

Foskett, N. L., E. G. Lowrance, and Wayne A. McRae

STONE AND WEBSTER/IONICS SO2 REMOVAL AND RECOVERY PROCESS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 1061-1080. (May 14-17.)*

A Stone and Webster/Ionics sulfur dioxide removal and recovery process which is applicable to gaseous effluents from stationary power plants burning fuels containing sulfur and to tail gases from sulfur recovery plants, smelters, and sulfuric acid plants is described. The process is based on the absorption of sulfur dioxide in a caustic solution which then is regenerated using electrolytic cells, the key component of the system. The essential steps of the process are: SO2 is absorbed from flue gas in a solution of caustic soda in water to produce a solution of sodium bisulfite containing some sodium sulfite; the sulfite bisulfite solution is mixed with sulfuric acid, causing release of SO2 from the solution for recovery or conversion, the solution being converted to sodium sulfate; and the sulfate solution is converted by an electrolyzer into two solutions, one containing caustic and the other sulfuric acid. The caustic solution is recycled for use in the first step, and the sulfuric acid solution is recycled for use in the second step. Phase one of a demonstration program at Wisconsin Electric s Valley Station in Milwaukee is currently underway and consists of design, installation, and operation of an integrated pilot plant, development of prototype scale electrolyzer system, preliminary design of a prototype system, and development of test programs and operating schedules. Installed cost of the SO2 removal unit is $14,000,000.

36749 **APTIC NO. 59303**

Foss, E.

THE SO2-SCRUBBER AT THE GRYCKSBO PAPER MILL. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 657-665, 691-697. 2 refs. (May 7-11.)*

The operation and efficiency of the sulfur dioxide scrubber at the Grycksbo (Sweden) Paper Mill are described. The scrubber system which was based on limestone is designed for a flue gas flow of 30,000 N cu m/hr at a temperature of 145 C. Dust collection efficiency was 99%, but SO2 efficiency was only 63%. In order to increase the scrubbing efficiency, a series of test runs were carried out with hydrated lime which has a better solubility than limestone. The SO2 cleaning efficiency was raised to 80-90%, but the cost of hydrated lime per ton of pulp is about 4 2/3% higher than limestone. For economical reasons it was not considered possible to use hydrated lime.

36750 **APTIC NO. 59829**

Foster, Michael R., John I. Jalbing, and Lester E. Patterson

CATALYTIC CONVERTOR TEMPERATURE CONTROL SYSTEM. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,744,248. 5p., July 10, 1973. (Appl. April 10, 1972, 3 claims).*

A catalytic converter temperature control system applicable to motor vehicle exhaust emission systems has been designed to incorporate a cooling loop for maintaining the operating temperature of the converter within a predetermined temperature range. The system includes a cooling loop, a crossover passage in the engine intake manifold, a pair of conduits separately connected at a Y-pipe, and a converter temperature responsive diverter valve that is operable to selectively route the gases through the conduits. One conduit has a relatively short length wherein the exhaust gases experience a small temperature loss, while the other conduit or cooling loop has a longer length of pipe, including a section of corrugated tubing having an increased heat transfer area, wherein the exhaust gases experience a large temperature loss. The diverter valve routes the exhaust gases through the crossover passage and shorter conduit during warmup and normal operating conditions; when the converter exceeds a predetermined temperature, the valve routes the exhaust gases through the crossover and into the longer conduit. The exhaust gas temperature in the latter case is thereby lowered to provide a lower inlet temperature at the converter and maintain the temperature of the converter within a predetermined range. (Author abstract modified)

36751 **APTIC NO. 59649**

Foulard, Jean and Jean Galey

NON-POLLUTING METHOD AND APPARATUS FOR PURIFYING ALUMINUM AND ALUMINUM-CONTAINING ALLOYS. *(L Air Liquide Societe Anonyme Pour l Etude et l Exploitation des Procedes Georges Claude, Paris (France)) U. S. Pat. 3,743,500. 6p., July 3, 1973. 6 refs. (Appl. Jan. 10, 1968, 17 claims).*

To degasify aluminum and aluminum alloys, a ladle is provided with two compartments interconnected by a bottom passage. Inert gas is insufflated in very fine bubbles into the lower portion of both compartments. The molten metal flows down the upstream compartment, then flows up the downstream compartment. There is no inner impediment in the compartments, nor in the passage. Since the conventional method of purification is to inject chlorine into the molten metal which can leak into the air, this method eliminates a source of pollution. The fumes from the metal bath into which chlorine is injected contain elemental chlorine and volatile chlorides which are poisonous and corrosive. This necessitates costly and cumbersome devices for collecting and neutralizing the fumes. The neutralization itself pollutes the water in which the reactant is dissolved, and the unavoidable leaks pollut the ambient air. Thus, the new method not only eliminates pollution, but is also less expensive, since it avoids the use of pollution control devices. (Author abstract modified)

36752 **APTIC NO. 59400**

Freiday, Jay Horl

AIR POLLUTION CONTROL SYSTEM FOR CHEMICAL RECOVERY UNIT. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,765,377. 4p., Oct. 16, 1973. 3 refs. (Appl. June 23, 1972, 2 claims).*

An air pollution control system for burning black liquor from a pulping process in a chemical recovery furnace has been developed to use a direct contact evaporator which does not have a scaling problem (such as the cascade type) and superheated steam in place of combustion gases for the heating and evaporation of water from the black liquor. Elimination of any contact between combustion gases and the black liquor and thus the elimination of resulting odors common to prior art methods of chemical recovery is achieved. The process still permits a concentration of black liquor at 68% solids or higher, if desired. The low pressure superheated steam is used both as the heating medium in the direct contact evaporator and also in a first air preheater supplying primary combustion air to the furnace. Moisture evaporated from the black liquor in the evaporator and steam leaving the first air preheater are used to preheat secondary combustion air for the furnace. (Author abstract modified)

36753 **APTIC NO. 59242**

Freyschuss, S.

TECHNICAL REPORT FROM THE STOCKHOLM UN CONFERENCE. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 37-42, 109-112. (May 7-11.)*

The 1972 United Nations Conference in Stockholm on environmental problems is discussed. It adopted a Declaration on the Human Environment and 106 recommendations directed to governments and international organizations concerning international action against environmental pollution. It also adopted five resolutions, the most important of which was a proposal to the General Assembly concerning the institutional machinery of the UN for future handling of environmental questions. The most important guiding principle in the declaration is the responsibility of states to ensure that activities within their own countries do not create damage to the environment of other countries which lie outside national jurisdiction. The struggle of all countries against pollution should be supported and the discharge of toxic substances and the release of heat in harmful quantities be stopped.

36754 **APTIC NO. 59682**

Fukunaka, Kazuji and Kikujiro Kihara

REGENERATION METHOD OF ACTIVE CARBON USED IN FLUE GAS DESULFURIZATION. *(Haien detsuryuyo kasseitan no seisei hoho). Text in Japanese. (Chugoku Sangyo Co., Ltd., Bizen (Japan)) Japan. Pat. Sho 48-42356. 2p., Dec. 12, 1973. (Appl. June 3, 1970, 1 claim).*

When used for desulfurization, activated carbon eventually deteriorates to the point of uselessness. The conventional reactivation process has a yield of 85% at the highest. In this invention, activated carbon is easily and efficiently regenerated by heating it in nitrogen gas at 500 C or higher. The lower the temperature, the longer the regeneration takes. At 850 C, only a few minutes are required. The new method features not only a shorter required time, but also a 90% or higher rate of regeneration.

36755 **APTIC NO. 60096**

Furukawa, S., T. Suzuki, S. Masumoto, N. Masuda, and I. Eguchi

NOX REDUCTION IN COMBUSTION EMISSION BY A HOT GAS SELF- RECIRCULATING BURNER. *(Netsu gasu jiko saijunkanshiki bana niyoru nensho haigasu-chu no NOx teigen no kokoromi). Text in Japanese. Preprint, Combustion Inst. Japan, p. 135-138, 1973. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 37.)*

Reduction of NOx in combustion exhaust emission is achieved with a hot gas recirculating burner. In this burner, the high speed blowing of air into a combustion chamber produces a pressure difference by which a part of the exhaust gas in the combustion chamber can be sucked into the mixing chamber. Complete combustion can be expected even at low air-fuel ratio and NOx formation is very small. The effects of air-fuel ratio, combustion gas temperature, and types of fuel on the formation of NOx were examined. When the combustion gas temperature increased, NOx formation due to thermal NO increased. Addition of nitrogen to a fuel oil increases NOx formation. For the fuels containing no nitrogen, the difference was observed in the NOx formation, possibly due to the difference in the theoretical flame temperatures. A model RB-100 burner was tested for a NHD-1200 type boiler of 1.2/hr capacity and satisfactory results were obtained.

36756 **APTIC NO. 59689**

Gage, Stephen

TECHNOLOGICAL ALTERNATIVES TO FLUE GAS DESULFURIZATION. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 13-56. 22 refs. (May 14-17.)*

A review of coal liquefaction, gasification, and advanced combustion processes indicates that technological alternatives to stack gas cleaning are just beginning to enter the pilot plant stage. Low-Btu gas production for utility boilers using Lurgi gasifiers and solvent refining of coal appear to be the first technologies that will be applied. Two coal liquefaction processes, H-Coal and COED, and high-Btu gas production appear to lag somewhat behind the present generation gasifier and solvent refined coal technolgies. Many other coal liquefaction and advanced gasifier processes with promising characteristics are only at the bench-top experimental stage. Electric power production costs will probably increase significantly as these new technologies are introduced, and stack gas cleaning may be significantly less expensive than the technological alternatives for many new and at least some existing power plants. Solvent refined coal appears to provide the least expensive fuel which should meet air quality standards in most areas. Air and water emissions from coal liquefaction, present generation gasifiers, and advanced gasifiers are not well characterized yet, but it appears that some new problems may arise through the chemical processing of coal. Stack gas cleaning is now and will continue to be for some years the only viable alternative to fuel switching to the degree that sulfur oxide emissions must be controlled to meet primary air quality standards. (Author summary modified)

36757 **APTIC NO. 60202**

Gaillard, Charles S.

METHOD FOR TREATING PULP DIGESTER BLOW GASES. *(Westvaco Corp., New York) U. S. Pat. 3,753,851. 5p., Aug. 21, 1973. 5 refs. (Appl. Oct. 22, 1971, 5 claims)).*

A process is described for treating hot, odoriferous blow gases from a pulp digester. A significant portion of the available heat is recovered, a portion of the odoriferous gases are removed and recovered, and the remaining gases are burned, resulting in further heat recovery. The digester blow gases containing water vapor, turpentine vapor, and gaseous sulfur compounds are passed through a series of direct condensers to a gas storage means before being conducted to an indirect condenser. The uncondensed gases leaving the indirect condenser are scrubbed while the condensate mixture leaving the indirect condenser is conducted to a turpentine separating means. Previous systems recovered heat but did not destroy odors, instead they released them to the atmosphere. Therefore, this new process is improved. (Author abstract modified)

36758 **APTIC NO. 59841**

Gallaer, Charles A.

FLUID INLET STRUCTURE FOR CYCLONE COLLECTORS. *(Envirotech Corp., Salt Lake City, Utah) U. S. Pat. 3,745,752. 6p., July 17, 1973. 5 refs. (Appl. Dec. 30, 1970, 4 claims).*

A fluid inlet structure has been designed for significantly increasing the operational efficiency of cyclone collectors by the reduction of eddy currents at the fluid inlet, a problem associated with prior art inlet structures. The cross sectional shape and dimensions of the inlet conduit vary in size along the direction of flow for gradually generating a velocity gradient in the fluid conduit flow at the outlet opeingin such that the velocities of flow steams at the outlet opening are greater as the distance from the housing axis increases. This velocity gradient results in all of the fluid entering the flow guide at about the same given point in time. The fluid tends to progress around the guide in an imaginary rotating plane resulting in inhibition of eddy current formation at the inlet flow guide. (Author abstract modified)

36759 **APTIC NO. 59836**

Garcea, Giampaolo

DEVICE FOR THE TIMED INJECTION OF AIR INTO THE EXHAUST DUCTS OF AN INTERNAL COMBUSTION ENGINE. *(Alfa Romeo S.p.A., Milan (Italy)) U. S. Pat. 3,742,712. 6p., July 3, 1973. 4 refs. (Appl. April 19, 1971, 5 claims).*

A device for timed injection of air into the exhaust ducts of an internal combustion engine to achieve reduction in unburned hydrocarbons and carbon monoxide has been designed by utilizing the exhaust valve itself when properly modified in the vicinity of the valve stem and valve guide. A kind of slide valve is obtained by suitably shaping the valve stem and valve guide so as to inject the diluent air when the exhaust valve is open and to prevent such injection when the valve is closed. Air is thus mixed with the exhaust gases in timed sequence and while the exhaust gases still retain their own heat.

36760 **APTIC NO. 60109**

Gardner, Orian R.

BURNER FOR LIGHT COMBUSTIBLE MATERIALS. *(Assignee not given.) U. S. Pat. 3,744,440. 6p., July 10, 1973. 6 refs. (Appl. July 19, 1971, 11 claims).*

A combustion apparatus for the incineration of light combustibles such as grain materials has been designed for superior control over uniformity and degree of combustion and hence air pollutant emission and provides vent means in the combustion chamber for the relief of trapped gases such as steam, thus differentiating it from prior art devices of its kind. Materials are introduced into a bottom portion of a vertical chamber which is open at its top. Gases which tend to be trapped beneath the combustion zone are vented from the chamber through suitable conduits and returned to an upper portion of the chamber if desired for more complete combustion. One embodiment of the invention includes a feed duct extending down through the chamber for introduction of combustibles, while another embodiment features a feed assembly with a hopper and feed mechanism for receiving combustibles and urging them up through a feed duct into the chamber. (Author abstract modified)

36761 **APTIC NO. 59842**

Glover, Boyd W. and Harold N. Rainey

SMOKE ELIMINATOR. *(Venus Electronics Corp., Oklahoma City, Okla.) U. S. Pat. 3,747,301. 4p., July 24, 1973. 6 refs. (Appl. Nov. 17, 1971, 5 claims).*

A smoke eliminator for the removal and purification of cooking fumes resulting from food preparation in eating establishments has been designed to include an electrostatic precipitator in its housing, thus differentiating it from prior art devices for such applications. The device consists of a box-like receptacle which is supported in a horizontal plane intersecting the smoke containing stream. The receptacle is provided with vertically aligned openings in its upper and lower surfaces, and a blower within the receptacle forms a forced draft for the stream. An electrostatic precipitator is supported by the receptacle transverse to the direction of flow for collection of the smoke-forming particulates and cleansing of the gas stream. (Author abstract modified)

36762 **APTIC NO. 60151**

Glowiak, Bohdan and Adam Gostomczyk

STUDY OF THE SULFUR DIOXIDE SORPTION EFFICIENCY OF ION EXCHANGERS. PART 1: LABORATORY EXPERIMENTS. *(Untersuchungen ueber die Effektivitaet bei der Sorption von SO2 auf*

Ionenaustauschern. Teil 1-Laboruntersuchungen). Text in German. (Staub, Reinhaltung Luft, 33(1):29-32, Jan. 1973. 12 refs.

The absorption of sulfur dioxide from the air by anion exchangers (Wofatit SBW in hydroxyl form) was studied in laboratory tests. Sodium hydroxide was best for the regeneration of the anion exchanger. The anion exchanger column contained sodium hydroxide and monobasic sodium sulfite which participate in SO2 absorption, too. Permanent wetting of the anion exchanger column with water spray increased absorption efficiency. Permanent wetting with NaOH solution during absorption was best because it provided for quantitative SO2 absorption and for regeneration simultaneously with absorption. The principal disadvantage of this method is the fairly high flow resistance at a comparatively low flow intensity.

36763 **APTIC NO. 60102**

Goda, Shuhei

INTRODUCTION TO CLOSED SYSTEM. *(Kurozudo shisutemu gairon). Text in Japanese. Preprint, the Japan Society of Instrument and Constrol Engineers, Tokyo, p. 1-9, 1973. 3 refs. (Presented at the Japanese Society of Instrument and Control Engineers Symposium on Environmental System, Kitakyushu, Japan, Nov. 26, 1973.)*

Closed systems are described. One concept of air pollution control by closed systems is that of an industrial complex which recovers and uses by-products in the various plants within the combinate. And an example is a complex in which heavy fuel oil desulfurized by an oil refinery plant on the premises is piped directly to a power plant which supports manufacturing operations also within the system. Sulfur compounds given off in the stack gases from the manufacturing industries are recovered and utilized by a sulfuric acid manufacturing plant, thus enclosing possible air pollutants. Another concept of closed systems is the specific process of recovering pollutant by-products from water or gases and purifying the carrier for repeated use. The regenerative and recirculatory processes also contain the pollutants and prevent possible emissions to the atmosphere.

36764 **APTIC NO. 59701**

Gogineni, M. R., J. R. Martin and P. G. Maurin

STATUS OF C-E S AIR QUALITY CONTROL SYSTEMS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 539-551. 8 refs. (May 14-17.)*

A wet lime/limestone scrubbing system for removal of particulate matter and sulfur dioxide from stack gases of steam generators has been developed by Combustion Engineering, Inc. A slurry of pulverized limestone or slaked lime enters directly into the reaction tank (located at the bottom of the scrubber), and recirculation pumps convey the scrubbing slurry from the reaction tank to the underbed spray nozzles. The incoming gas contacts the sprayed slurry and continues to the bed. The removal of SO2 and particulates occurs in the bed. The scrubbing cycle continues with the reacted materials draining to the reaction tank which is designed to provide for completion of chemical reactions and precipitation of solids. Pumps recirculate the scrubbing solution from the reaction tank. Descriptions are provided for various industrial installations of the system.

36765 **APTIC NO. 60136**

Goldfield, Joseph and Vincent Greco

FILTERING PROCESS. *(Johns-Manville Corp., New York) U. S. Pat. 3,745,748. 16p., July 17, 1973. 14 refs. (Appl. Oct. 29, 1970, 10 claims).*

A process for the removal of submicron aerosol particles from large quantities of gas at an efficiency of at least 80% by means of a fibrous filter medium has been developed at economically feasible power consumption rates and at relatively high volumetric flow rates as compared with prior art devices of similar nature. The filtration process is accomplished by passing the gas through a filter medium composed of fibers having an average diameter of up to about 10 micron at a velocity of at least 300 ft/min and at a pressure drop not greater than 40 in. of water. (Author abstract modified)

36766 **APTIC NO. 60172**

Gourdine, Meredith C.

APPARATUS FOR SUPPRESSING AIRBORNE PARTICLES. *(Gourdine Systems, Inc., Livingston, N. J.) U. S. Pat. 3,757,491. 9p., Sept. 11, 1973. 9 refs. (Appl. Nov. 5, 1970, 1 claim).*

An electrogasdynamic apparatus for suppressing airborne particles, dust, or the like, by a distribution of charged, minute liquid droplets throughout the zone contaminated by the airborne particles is described. Passage through a corona discharge region charges the droplets, which then are passed through a channel to the contaminated zone. A space charge field is established. As the particles are forced through the channel, the charged droplets decelerate under the influence of an axial field gradient. An electrogasdynamic exchange occurs, by which the droplets exchange kinetic energy for electrical potential. The droplets disperse, passing among the contaminant particles, attracting, being attracted to, and charging contaminant particles. Since the particles gain associated electrical charge, they move to nearby surfaces. An enclosure about the contaminated location reduces the spread of airborne particles and adds additional collection surface area. In mining, dust is suppressed at mine product transfer points, or the dust control apparatus is mounted on a continuous mining machine effectively to isolate the machine s operator station from locations of greatest dust concentration. The apparatus is an improvement over plain water sprays, electrostatic precipitators, and charged sprays previously used. (Author abstract modified)

36767 **APTIC NO. 59874**

Gracheva, M. P., Yu. P. Tikhomirov, V. N. Kalentev, and D. N. Okorokov

ON THE INCINERATION OF INDUSTRIAL SOLID WASTES AS A METHOD OF THEIR INACTIVATION. *(O szhiganii tverdykh promyshlennykh otkhodov kak metode ikh obezvrezhivaniya). Text in Russian. Gigiena i Sanit., no. 3:102-103, 1973. 3 refs.*

The efficiency of the incineration of industrial solid wastes from the processing of thermplasts and thermosets, as well as the incineration-generated phenol, ammonia, and formaldehyde emissions were studied. Teh incineration was conducted in a chamber furnace of 230 kg/hr capacity at 1200 C temperature. The incineration as a method of destruction proved highly efficient provided adequate measures for uniform feeding, uniform rate of incineration, and high incineration temperature, all necessary for the quantitative combustion of the organic component, are taken. Under such conditions, and through enlargement of the combustion chamber volume, it was possible to substantially reduce the ammonia and phenol emissions. The ammonia and phenol concentrations in the flue gas averaged 3.53 mg/cu m and 0.11 mg/cu m, respectively. Many gas samples were free from phenol, ammonia, and especially from formaldehyde.

36768 **APTIC NO. 60205**

Graham, James R.

CATALYTIC CONTROL OF AUTO EXHAUST EMISSIONS. *(Grace (W. R.) and Co.) U. S. Pat. 3,755,534. 8p., Aug. 28, 1973. 10 refs. (Appl. Aug. 12, 1971, 4 claims).*

A method of converting the noxious components of automobile exhaust gases to innocuous entities by contacting the gases with a palladium catalyst on a suitable support followed by passing the gases over a catalyst active for hydrocarbon conversion on a suitable support is described. The use of this particular configuration results in improved conversion of the carbon monoxide and hydrocarbons in the exhaust gases. This method overcomes disadvantages of previous methods. The catalyst exhibits good thermal and chemical stability. The system of separate monoliths which support palladium or platinum catalysts in the proper configuration to nearly completely remove HC and CO from the automobile exhaust, eliminates the problem of catalyst supports which can change form because of surface activity. (Author abstract modified)

36769 **APTIC NO. 59438**

Grey, Jerry

APPARATUS FOR REMOVING CONTAMINANTS ENTRAINED IN A GAS STREAM. *(Assignee not given.) U. S. Pat. 3,765,153. 14p., Oct. 16, 1973. 12 refs. (Appl. Nov. 30, 1971, 9 claims).*

An incinerator capable of producing a low particulate content and reduced concentration of gaseous contaminants in the effluent has been developed such that it is relatively simple in construction and inexpensive to operate as compared to other new incinerator designs. A means for conducting the combustion gases from the combustion chamber to the flue includes a passage for imparting a curved motion to the combustion gases and contains several sets of electrodes for producing electrostatic fields through which a portion of the gases traverse. A means for ionizing solids and gaseous molecules entrained in the combustion gases is located either upstream of the electrostatic fields or in conjunction with them. Hence, the combustion gases are subjected to cooperating centrifugal, electrostatic, and gravitational forces as they traverse the passage for removal of contaminants. (Author abstract modified)

36770 **APTIC NO. 59348**

Groenendaal, Willem and Walter M. Lenz

COMBINED SULFUR OXIDES ACCEPTANCE-SULFUR RECOVERY PROCESS. *(Shell Oil Co., New York) U. S. Pat. 3,764,665. 7p., Oct. 9, 1973. 3 refs. (Appl. Feb. 7, 1972, 10 claims).*

An improved process in which sulfur oxides are accepted from gas mixtures on solid acceptors and are subsequently freed again by regeneration of these acceptors, with the regeneration off-gases being passed to a Claus sulfur recovery process, has been developed for the removal of sulfur oxides from flue gases. The invention s improvement comprises cooling the regeneration off-gas to condense the water vapor contained therein, contacting the cooled off-gas with a sulfur dioxide-selective liquid absorbent, and passing the fat liquid absorbent to a buffer zone and then to a stripping zone where the absorbed SO2 is recovered from the liquid absorbent and supplied to the sulfur recovery process. Preferred acceptors are metal and/or metal compounds applied to a suitable carrier which are capable of binding SO2 and/or sulfur trioxide as a sulfate for subsequent release as SO2 upon regeneration. The process ensures that fluctuations in the SO2 concentration of the regeneration off gas are leveled out and that a relatively concentrated SO2 stream is supplied to the sulfur recovery process at a substantially constant rate. (Author abstract modified)

36771 **APTIC NO. 59800**

Gumbleton, James J. and Paul B. Kuehl

EXHAUST GAS RECIRCULATION CONTROL VALVE. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,749,071. 4p., July 31, 1973. 2 refs. (Appl. April 19, 1972, 2 claims).*

A novel exhaust gas recirculation control valve for use in internal combustion engines is described. It utilizes the exhaust back pressure to recirculate exhaust gases at a rate proportional to air flow and in a manner which avoids recirculation of exhaust gases through the carburetor. An exhaust gas recirculation passage is provided which extends from the engine exhaust passage to the engine air induction passage at a point downstream of the engine throttle. An orifice is provided in the recirculation passage, and a valve disposed downsteam of the orifice is operated by a bellows to create a zone of substantially constant pressure in the passage irrespective of the wide variations in exhaust back pressure and induction passage vacuum. The pressure in the zone may be maintained either above or below atmospheric pressure, and the rate of recirculation of exhaust gases through the zone will be proportional to the rate of induction air flow. (Author summary modified)

36772 **APTIC NO. 59826**

Halloran, John J.

AIR PURIFIER. *(Environmental Technology Corp., Newtown, Pa.) U. S. Pat. 3,744,216. 5p., July 10, 1973. 21 refs. (Appl. Aug. 7, 1970, 8 claims).*

An indoor air filtering apparatus having an efficiency of 99.0% for contaminants of at least 0.3 micron in size has been designed for more efficient and effective removal of gaseous, particulate, and microorganism-type pollutants encountered in buildings. Gaseous contamination is removed by the use of an odor oxidant which does not desorb and re-emit the odor constituents. Contaminants entering the filter are initially subjected to mechanical filtering; odors are then removed, and an ultraviolet lamp acts to subsequently kill microorganisms present. The air then passes through a high efficiency electrostatically-charged filter and is finally returned to the room by blowers.

36773 **APTIC NO. 59831**

Hallum, Charles E.

ENGINE EMISSION CONTROL DEVICE. *(Philco-Ford Corp., Philadelphia, Pa.) U. S. Pat. 3,744,251. 4p., July 10, 1973. 4 refs. (Appl. May 1, 1972, 8 claims).*

An internal combustion engine exhaust gas flow restricting device which can be operated automatically and selectively to variably increase exhaust gas flow back pressure and reduce nitrogen oxide output has been designed such that in at least two embodiments of the invention there are no movable mechanical parts in the exhaust stream in contradistinction to prior art devices of similar function. Exhaust gases are discharged into a vortex chamber that either provides essentially no resistance to discharge of the flow or variably increases the impedance or resistance to flow as a function of the entry of flow from a radial to a tangential direction. The tangential direction applies centrifugal force to the flow and creates turbulence, thus increasing resistance to discharge. The means of switching the flow from a radial to a tangential direction in one instance consists of a source of compressed air provided by the engine that also combines with the unburned hydrocarbons and carbon monoxide elements to reduce them to less harmful forms; alternatively, fluidic diverter valves automatically switch the flow from a stable direction to an alternate direction by means of an electrically actuated tab or air signal force. (Author abstract modified)

36774 **APTIC NO. 60286**

Hammond, Myers G.

HIGH-STRENGTH ACID CONTAINING H2O2 TO SCRUB SO2. *(du Pont de Nemours (E. I.) and Co., Wilmington, Del.) U. S. Pat. 3,760,061. 4p., Sept. 18, 1973. 4 refs. (Appl. March 2, 1971, 5 claims).*

Sulfur dioxide can be oxidized to sulfuric acid by a process that involves contacting the SO2 with an aqueous scrubbing solution of sulfuric acid containing hydrogen peroxide and/or the peroxy acids of sulfur in a gas-liquid contacting device in which the liquid scrubbing phase is made to be the continuous phase during the actual contacting. In this process, the acid concentration of the scrubbing solution can be as high as 99% or more by weight H2SO4. The process is useful in the abatement of SO2 from waste gases created during the manufacture of H2SO4 and also for abating SO2 from other stack gases, thus alleviating pollution problems. Further, since the hydrogen peroxide or peroxy acids oxidize the SO2 to H2SO4, the process results in a useful product. This process produces an H2SO4 product of higher concentration than in previous processes, and it has wide-spread commercial use. (Author abstract modified)

36775 **APTIC NO. 59429**

Hardison, Leslie C.

VENTURI SCRUBBER SYSTEM INCLUDING CONTROL OF LIQUID FLOW RESPONSIVE TO GAS FLOW RATE. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,768,234. 6p., Oct. 30, 1973. 13 refs. (Appl. Dec. 17, 1969, 2 claims).*

An improved scrubber system has been developed which incorporates a venturi section and a means for maintaining a substantially constant pressure drop through the venturi throat section. Automatic regulation of the liquid introduction rate to the venturi throat section of the unit eliminates the need for mechanically modifying the throat size and thus avoids mechanical problems associated with previous state-of-the-art devices. Pressure tap means are provided in the flow path of the gas stream to indicate a pressure drop which shows an equivalent to pressure change across the venturi throat section. Differential pressure controls then effect an immediate change in the liquid flow rate to the throat and thus maintain a constant pressure differential across the venturi to insure constant efficiency.

36776 **APTIC NO. 59439**

Hardt, Lothar, Heinz Mueller-Wartenberg, and Hans Rauschenberger

TUBE-TYPE ELECTROSTATIC PRECIPITATOR. *(Metallgesellschaft Aktiengesellschaft, Frankfurt/Main (Germany)) U. S. Pat. 3,765,154. 8p., Oct. 16, 1973. 5 refs. (Appl. Jan. 3, 1972, 10 claims).*

A liquid-film electrostatic precipitator of the tube type has been developed with improved liquid-film distribution uniformity and dust or smoke pickup and with more efficient compensation or absorption of temperature and pressure stresses. The interior of the dust-collector tubes is provided with a film of conductive liquid to which the particles are attracted and which surrounds a corona discharge electrode. The exteriors are provided with fiberglass-reinforced synthetic-resin bands. The interiors are sandblasted or otherwise roughened to a minimum roughness of 15 micron. The roughening step eliminates the liquid-shedding character of the surfaces and allows a thin but coherent liquid film to form over the entire surface of the collecting tubes. The resistance of such continuous films to breakdown is increased when the gas to be purified is fed through the tubes downwardly.

36777 **APTIC NO. 59793**

Hario, S.

STUDIES ON ODOR REMOVAL OF HUMAN MANURE BY MEANS OF HEAVY METAL CATALYSTS. PART I. *(Jyukinzoku gosei shokubai o mochiita shinyo shuki jokyo nikansuru kenkyu (I)). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 2(11):852-860, Nov. 1973. 45 refs.*

A pilot plant-sized device was developed to remove odor originating from a human manure treatment facility. The device consists of three catalyst layers using two kinds of heavy metal catalysts. A series of odor removal experiments were carried out to obtain data for designing a practical device. As a result, an odor removal plant of 288 kl/day capacity was constructed at Fujimi human manure treatment facility. The report briefly describes fundamental concepts of odor nuisance, catalytic combustion, and preliminary experimental data of odor control for human manure. The odor measurement showed odor of human manure to be 65-400 ppm hydrogen sulfide, 15-40 ppm ammonia, 0-0.6% carbon dioxide, 19.7-20.4% oxygen, and 1550-2330 ppm methane. A low-temperature adsorption catalyst consisting mainly of zinc oxide was tested at a gas flow rate of 12.5 l/min and space velocity of 1000-1130. The result showed complete removal of H2S and NH3, but some indoles, amines, and fatty acids remained in the gas. A cuprous oxide-chromic oxide catalyst was designed to remove the above indoles, amines and fatty acids and showed promising results.

36778 **APTIC NO. 59690**

Harrington, R. E.

STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 57-68. (May 14-17.)*

Factors affecting the status of sulfur oxide control technology and relating to the need for flue gas desulfurization are outlined. Low sulfur fuel will be a major tool in achieving ambient air quality standards over the next few years, notwithstanding the fact that it falls far short of being a sufficient solution for SO2 control. Fuel substitution can and will be used to a limited extent; though many problems exist of a proprietary, legal, and logistical nature that will preclude approaching the full theoretical potential of fuel substitution. Fuel cleaning technology appears to be at least 10 years away from making a major impact on the increased availability of clean fuel. Flue gas cleaning technology is the principal tool available for SO2 control for at least the next 10 years, while industrial combustion is the number one problem source of SO2 in the United States requiring solution. Considerable effort is required to extend the application of processes which have been designed for utility application to industrial combustion control; and increased attention must be directed toward developing processes uniquely applicable to small industrial combustion, industrial processes, and area sources. (Author summary modified)

36779 **APTIC NO. 60065**

Hathorn, Roy C.

STEAM REMOVAL APPARATUS FOR DISCHARGE STACK. *(Assignee not given.) U. S. Pat. 3,751,884. 4p., Aug. 14, 1973. 6 refs. (Appl. Sept. 23, 1971, 4 claims).*

Previously, difficulties have been encountered removing steam from furnace discharge stacks, such as cupolas using air pollution control systems. That is, while effective means have been devised for removing solid particles from a gaseous stream, no satisfactory method had been proposed for continuously removing steam from a moving steam comprising steam and other gaseous products. Therefore, this steam removal apparatus was invented. Portions of metal members having high thermal conductivity extend into a stack while other portions extend away from the stack and out of contact with steam and other gaseous products conveyed by the stack. This reduces the temperature of the inwardly extending portions by conducting the heat to other portions. A collector receives water condensed onto the inwardly extending portions, and a discharge removes water from the collector. (Author abstract modified)

36780 **APTIC NO. 60282**

Haty, R. and K. S. Chari

POLLUTION AND ITS ABATEMENT IN FERTILISER INDUSTRY. *Indian J. Environ. Health, 15(4):289-303, Oct. 1973. 42 refs.*

Control methods for major air pollutants generated by fertilizer manufacturing operations are reviewed. Pollutants of significant concern include: dust, sulfur oxides, nitrogen oxides, fluorides, and ammonia. Abatement methods outlined include: collectors, wet scrubbing methods, electrostatic precipitation, various filter devices, dry absorption and adsorption processes, chemical and catalytic reduction, catalytic oxidation, combustion techniques, and by-product recovery. Major effects on the environment and human health are also tabulated for are also tabulated for each pollutant considered.

36781 **APTIC NO. 59608**

Hegedus, Jozsef

UNBURNED HYDROCARBON EMISSIONS FROM SPARK IGNITION ENGINES. *(Otto-motorok elegetlen szenhidrogen emisszioja). Text in Hungarian. Jarmuvek Mezogazd. Gepek, 20(10):361-366, Oct. 1973. 6 refs.*

Devices developed for the abatement of unburned hydrocarbon emissions from spark ignition engines especially during deceleration are described. Thirty-three percent of all HC emissions occur during deceleration, while the respective shares of idling, acceleration, and steady driving are 5, 30, and 32%. Hydrocarbon emissions are due mainly to the quenching effect of the combustion chamber wall, and to the diluting effect of the remaining combustion products. Rapid increase in the unburned HC emissions at suction pipe pressures below 520-540 mm mercury column was observed. Devices developed for the reduction of unburned HC emissions prevent the suction pipe pressure from decreasing to below 520 mm Hg. One throttle governor retards the closing of the throttle during the final stage of the closing motion. Such retarders, set at 6 mp retardation, reduce the unburned HC emissions by 75-46% in vehicles with stick-shift transmissions, and 66-12% in vehicles with automatic transmissions. Such governors are efficient and suitable for short-term deceleration, they can be easily mounted, and do not essentially interfere with driveability. Another type of throttle governor automatically opens the throttle, thus preventing the suction pipe pressure from falling below the critical value. Such governors are efficient also during extended acceleration, but they are relatively complicated, and also increase the brake wear due to reduced engine braking.

36782 **APTIC NO. 60031**

Heiba, El-Ahmadi Ibrahim and Sundaresa Srinivasan

METHOD OF REMOVING HYDROGEN SULFIDE FROM GASES. *(Mobil Oil Corp., New York) U. S. Pat. 3,761,569. 3p., Sept. 25, 1973. 3 refs. (Appl. Jan. 28, 1971, 9 claims).*

A method for removing hydrogen sulfide from a gas stream is described. The hydrogen sulfide-containing gas is passed through a solution of cupric ions in a strong acid in the presence of oxygen. Elemental sulfur is separated out as a precipitate, without significant loss of the copper through copper sulfide formation. Thus, the copper is continuously regenerated, unlike the copper in previous, similar processes. The process can remove H2S even in very low concentrations from gases where air pollution problems are considerable, such as in refinery gases.

36783 **APTIC NO. 59968**

Higure, T.

CATALYTIC CONVERTER FOR AUTOMOTIVE EXHAUST EMISSION. *(Shokubai hanno hoshiki niyoru haishutsu gasu joka sochi). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(11):1284-1286, Nov. 1973.*

A Tetsudo Sharyo Kogyo, Tetsusha N.O.C. 20 catalytic converter is described. This catalytic converter consists of a venturi, a catalytic reactor, a silencer, and signalling sections and it is applicable to a 1800-2000 cc automobile. The catalyst was platinum and palladium, supported by granular alumina having a specific surface area of 110-120 sq m/g. The exhaust gas is mixed with secondary air which is supplied through the silencer and enters into a heat exchanger. The heated gas passes through the catalytic chamber, in which carbon monoxide and hydrocarbons are catalytically oxidized to carbon dioxide and water, and nitrogen oxides are reduced. A four-mode 20,000 km driving test using regular gasoline showed reduction efficiency of 70% for CO, 56% for HC, and 4.5% for NOx. Power loss was 1% at low speeds and 3% at high speeds. Acceleration was also lowered to 0.34 sec for 0 to 200 and 0.81 sec for 0 to 400 m. No change in fuel consumption was observed.

36784 **APTIC NO. 59717**

Hollinden, Gerald A., Neal D. Moore, P. C. Williamson, and D. A. Denny

REMOVAL OF SULFUR DIOXIDE FROM STACK GASES BY SCRUBBING WITH AMMONIACAL SOLUTIONS: PILOT SCALE STUDIES AT TVA. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 961-996. 9 refs. (May 14-17.)*

Results are presented from Tennessee Valley Authority- Environmental Protection Agency pilot studies of ammonia scrubbing at the TVA's Colbert coal-fired steam generating station. Sulfur dioxide recoveries have been generally excellent (approximately 90% efficiency), and ammonia losses have been low using the ammoniacal scrubbing solutions. The principal advantage in the process is economic regeneration by acidulation with ammonium bisulfate produced from thermal decomposition of ammonium sulfate. Some problem areas which have been established are: fume formation in the scrubber and after discharge from the stack; fly ash separation; and ammonium sulfate separation. It is possible to control the fume formation inside the scrubber while operating at relatively high salt concentrations under proper operation of the system except, perhaps, for days of low temperature and high relative humidity. Several promising leads are to be investigated regarding fly ash and ammonium sulfate separation.

36785 **APTIC NO. 60181**

Holub, Josef and Jaroslav Koliha

SMOKELESS FUEL FROM THERMAL REFINING OF COAL. *(Tepelne zuslechtovani uhli pro vyrobu bezdymych paliv). Text in Czech. Uhli, 21(11):470-476, 1973. 12 refs.*

Smokeless fuel was prepared by pelletization of coal dust and subsequent carbonization of the pellets for 5-15 minutes at 700 850 C, using preheated sand as the heat transfer agent. Best results were obtained with low-coking flotation concentrates, particle size greater than 1 mm (90% greater than 0.6 mm), with 10-12% water as binder; larger pellets (40-50 mm) required the addition of 4.5% sulfite liquor as additional binder. The pellets had sufficient strength for handling, and low abrasion losses. Carbonization at 700 C in hot sand gave a fuel with low volatile matter content (approximately 5%). Designs of the apparatus are shown. A continuous process, combining pelletization and carbonization, was used for laboratory experments. A tilted rotating disk pelletizer with a continuous water spray was used in the laboratory to produce up to 4 kg pellets per hour; the size of the pellets is determined by the tilting angle of the pelletizer disk. A pilot plant mock-up produced up to 150 kg pellets per hour.

36786 **APTIC NO. 59707**

Hunter, William D., Jr.

APPLICATION OF SO2 REDUCTION IN STACK GAS DESULFURIZATION SYSTEMS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 657-672. (May 14-17.)*

An Allied Chemical Company single train plant for reduction of sulfur dioxide to elemental sulfur is outlined along with its application to emission control in metallurgical operations and fossil fuel combustion. The reduction process can be applied directly to gas sources where the SO2 content is 4-5% or more and where oxygen content is limited. Various metallurgical emissions can therefore be processed directly in the system. The process has the versatility of being adaptable to feed gases containing any SO2 concentration up to 100% (dry basis) and may be joined with one of several regenerable flue gas desulfurization processes for those applications where the oxygen content is too high or SO2 concentration too low. A capital cost comparison for three feed gas concentrations indicates that SO2 reduction is strongly favored by increasing system size.

36787 **APTIC NO. 59426**

Hurst, Francis Carl

EXHAUST EMISSION CONTROL FOR INTERNAL COMBUSTION ENGINES UTILIZING AN ELECTRICALLY HEATED CHOKE.

(Chrysler Corp., Highland Park, Mich.) U. S. Pat. 3,768,453. 6p., Oct. 30, 1973. 3 refs. (Appl. Oct. 13, 1972, 13 claims).

An electrically heated choke for automobiles with internal combustion engines has been developed to reduce the hydrocarbon and carbon monoxide emissions due to choke enrichment of the fuel air mixture and to shorten the period of choke operation when the ambient temperature is above a predetermined level. A pair of thermostatic control switches regulate the operation of a choke heater adjacent the choke during engine starting and warm-up, thereby reducing the emissions. A normally closed thermostatic time delay switch is electrically connected in series with one of the switches and is responsive to a predetermined temperature for a predetermined period of time for actuation. A heating element, electrically connected in series circuit between the time delay switch and the other side of the source of power, is positioned in thermal relationship to a thermal bimetal member for supplying heat thereto for a predetermined period of time controlled by the third switch when the first and second switches are actuated.

36788 **APTIC NO. 59434**

Ibusuki, Ikira and Kenji Yamamura

PREVENTION TECHNIQUES FOR MALODOURS IN KRAFT PULP MILL.

(KP kojo akushu boshi gijutsu). Text in Japanese. Sumitomo Jukikai Giho (Sumitomo Heavy Mach. Tech. Rev.), 21(62):81-89, Dec. 1973. 5 refs.

The previously published and tested methods of steam stripping for Kraft Pulp mills were achieved in normal pressure. In spite of the merit of high BOD and COD elimination rate and recovery of turpentine oil simultaneously with deodorization, steam stripping was disadvantageous because of the high running cost due to the enormous quantity of steam required. This weakness was improved by achieving steam stripping under reduced pressure. Coefficients of 60-70 C (equivalent to 1/3 ata) and 100 C were only 25-40% different, but with the lower pressure, the steam quantity could be reduced to 1/2.5-1/3%. In this system, first the Kraft pulp liquid is sent to the storage tank and pH is adjusted there. The liquid is then heated to the optimum temperature of 67 C by the return liquid from the deodorization tower. A plate heat exchanger or steam injector may be used for the heat exchange. The liquid is then sent to the top of the deodorization tower. From the bottom of the tower, vacuum pressure steam (0.4 ata) is injected. The reaction tower can be a bubble cap type of sieve tray. Countercurrent contacts effectively achieve transferring of odor elements from the liquid to steam. The odor elements in steam are concentrated in the surface condenser at the top of the tower and non-condensation gas and condensate are separated. Condensate with high concentration of odor elements and BOD-COD is sent back to the deodorization tower for recirculation. The gas is sent to the gas-water separator, and after separation, the gas is sent to the combustion system by Nash pump. Mathematical and chemical analyses are presented. Test operations by a pilot plant resulted in more than 99% effective stripping of hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide, and the desulfurization rate was between 96.70 and 99.73%.

36789 **APTIC NO. 59547**

Idemura, Hideo

NEW FLUE GAS DESULFURIZATION PROCESS.

Preprint, Chiyoda Chemical Engineering and Construction Co., Ltd., 13p., 1973. 11 refs. (Presented at the Achema-Congress, June 20, 1973.)

A new flue gas desulfurization process is described. The Chiyoda process is based on the absorption and catalytic oxidation of sulfur dioxide in a dilute solution of sulfuric acid that serves as the absorbent. Sulfur dioxide and oxygen in the charged air react with each other to form sulfuric acid; and the dilute acid produced is withdrawn and treated with limestone powder to precipitate sulfate ion as gypsum, the by-product of the process. The gypsum crystals are separated from the mother liquor in a centrifuge, and th emother liquor is returned to the process. The combination of absorption and oxidation as well as the use of an effective catalyst for oxidation have eliminated shortcomings of previous systems which made removal of sulfur dioxide from flue gas by physical absorption in water of dilute sulfuric acid impractical because of the low solubility of SO2 and the large quantity of absorbent required. The oxidation catalyst is strongly resistant to poisoning, and the process may be applied to several types of flue gases including off-gas from smelters, tai gas from sulfur recovery plants, flue gas from high sulfur oil, and coal-fired flue gas.

36790 **APTIC NO. 59681**

Iijima, Ayumu and Kunihiko Kashimura

METHOD OF ELECTRIC CHARGING FOR ELECTROSTATIC PRECIPITATOR.

(Denki shujinsochi no kaden hoho). Text in Japanese. (Origin Electric Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-42908. 4p., Dec. 15, 1973. (Appl. July 17, 1969, 1 claim).

There are two basic ways of charging the electrodes of an electrostatic precipitator: one is to apply voltage somewhat lower than that causing the transition from corona discharge to spark flashover, and the other is to automatically adjust the applied voltage so that the spark flashover may be limited to an appropriate number of times. The latter method is more popular due to its higher dust-collecting efficiency. This invention relates to an innovation of the latter method. Generally, the efficiency is higher with a high voltage applied between the positive and negative electrodes. When the applied voltage contains more pulsating components, the voltage needed to cause sparking is higher and the voltage increase needed to cause the spark discharge to change to an arc discharge is greater. Based on this finding, this invention offers a new method in which linearly increased voltage is overlapped with that of saw tooth wave to achieve higher dust-collecting efficiency.

36791 **APTIC NO. 59289**

Ikegaya, Hiroshi and Teruo Arakawa

REMOVAL OF SOX, NOX GAS BY ACTIVE CARBON.

(Kasseitan ni yoru NOx, SOx no jokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):434, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 168.)

The efficiencies of 4 m/m diameter and 6 m/m diameter activated carbon particles for a stack gas desulfurization and denitrization system were examined. The system has a preduster low pressure venturi scrubber, activated carbon absorption tower, and heat exchangers. Adsorption is achieved by scrubbing and the acidic liquid waste after adsorption is neutralized by alkali and suspended substances are eliminated before discharging. The amount of carbon was 2O4 kg each; density, 0.6 kg/l; fuel sulfur content, 2.5%; fuel consumption 50 l/hr; emission gas, 607 N cu m/hr; sulfur dioxide concentration at the entrance, 1.161 ppm; and measurements were taken by infrared analyzer. For about 10 hr, the adsorption efficiency for desulfurization showed no difference between the two sizes of particles; after that 4 m/m diameter was a little better. But when 6 m/m diameter particles were packed to obtain the same surface area as 4 m/m diameter particles, the same efficiency was obtained. Denitrization efficiency was 14%; therefore, SO2 concentration had to be first lowered before passing the gas through carbon layer.

36792 **APTIC NO. 59978**

Imai, Takao

AIR-CONDITIONING SYSTEM DESIGNED WITH CARE GIVEN TO AIR POLLUTION PREVENTION (ENERGY-SAVING). *(Taiki osen boshi (sho enerugi) o koryo shita kucho shisutemu). Text in Japanese. Kuki Seijo (Clean Air-J. Japan. Air Cleaning Assoc., Tokyo), 11 (Supplement 1):59-67, Nov. 1973.*

Reductions in the fuel consumption of air conditioning equipment can be effected by the use of insulation, remote heating, and various heat recovery systems.

36793 **APTIC NO. 59676**

Inoue, Kiyoshi

ELECTRIC PURIFICATION DEVICE. *(Denki joka sochi). Text in Japanese. (Inoue, Kiyoshi and Inoue Japacks Research Inst. Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 48-35982. 3p., Oct. 31, 1973. (Appl. April 3, 1969, 1 claim).*

Although generally economical and efficient in purifying air, an electrostatic precipitator (EP) is subject to the disadvantage that the air purified contains a large quantity of ozones produced by corona discharge during the air cleaning process. In this invention, an electrostatic precipitator is combined with an ozone remover. The activated charcoal filter used to remove ozones is automatically kept clean. The EP section of the device consists of a fine wire discharge electrode and cylindrical dust-collecting electrodes. The air cleaned by the EP section flows into the ozone-removing section where excess ozones and other remaining impurities are thoroughly removed.

36794 **APTIC NO. 60035**

Isaksson, Axel Mentor

METHOD FOR REDUCING THE SULFUR TRIOXIDE CONTENT OF COMBUSTION GASES RESULTING FROM THE COMBUSTION OF SPENT PULPING LIQUORS. *(Bycosin AB, Karlstad (Sweden)) U. S. Pat. 3,745,064. 2p., July 10, 1973. 9 refs. (Appl. Dec. 28, 1970, 9 claims).*

A method for significantly reducing the amount of sulfur trioxide produced during the combustion of spent pulping liquors from sulfite and sulfate cellulose processes is described. The preferred embodiment of the process is accomplished by mixing magnesium sulfate and a magnesium fatty acid soap with the waste off-lye liquor prior to the combustion of the off-lye liquor. The fatty acid is preferably a tall oil fatty acid. The MgSO4 is dissolved in water, and the solution is then added to an emulsion or solution of Mg soap. MgSO4-Mg soap solution is then added to the waste off-lye liquor prior to combustion.

36795 **APTIC NO. 59856**

Jordan, Robert K.

AIR-FILTER AND CARBON-BED ELEMENT FOR AN AIR CLEANER ASSEMBLY. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,747,303. 5p., July 24, 1973. 2 refs. (Appl. June 1, 1971, 3 claims).*

A combination air filter and carbon bed element for adsorbing and desorbing hydrocarbon vapors rising from the fuel reservoir in a carburetor of an internal combustion engine is described. The ring of activated carbon particles extends between the air inlet and air outlet sides and between the top and bottom surfaces of the air filter for securement across the air path. An elevated portion has a passage for the conduction of air required during normal engine operation, while a base portion cooperates with the elevated portion to adsorb hydrocarbon vapors before they rise to the level of the passage. Air flows from the inlet to the outlet side of the air cleaner and into the carburetor when the engine is running to allow for desorption of vapors previously adsorbed.

36796 **APTIC NO. 60209**

Joyce, Ronald Stone and George Robert Stoneburner

ADSORBING EVAPORATIVE EMISSION DURING FUELING OF AUTOMOTIVE VEHICLES. *(Calgon Corp., Pittsburgh, Pa.) U. S. Pat. 3,748,829. 5p., July 31, 1973. 4 refs. (Appl. July 2, 1970, 2 claims).*

A device for the control of evaporative emissions from hydrocarbon fuels, particularly gasoline, has been designed for attachment to delivering devices. The apparatus includes the use of an adsorbent such as activated charcoal in combination with the delivering or storage means (nozzle, underground tank, automobile tank). The adsorbent is disposed on the delivery means such that escaping vapors must pass through it. Activated carbons are the preferred adsorbents, although other hydrocarbon adsorbents such as molecular sieves can also be employed.

36797 **APTIC NO. 59358**

Kamino, Yasumi, Shigenori Onitsuka, Shiro Inoue, and Kenji Yasuda

A STUDY ON DESULPHURIZATION OF FLUE GASES BY THE ACTIVE CARBON PROCESS USING STEAM DESORPTION (PART 5) - DETERIORATION AND REGENERATION OF ACTIVE CARBON. *(Suijoki datsurishiki kasseitanho ni yoru haien datsuryu (daigoho)-Kasseitan no rekha to saisei). Text in Japanese. Hitachi Zosen Giho (Hitachi Zosen Tech. Rev.), 34(3):18-21, 1973. 4 refs.*

Envirommental conditions contributing to the deterioration of activated carbon were investigated in an effort to clarify the causes of sulfur dioxide adsorption capacity deterioration. Exposure to oxygen at a temperature level of around 300 C demonstrated a large influence on the adsorption capacity of activated carbon to SO2; and further studies showed a relationship between the deterioration in degree of activity and the concentration of O2 in the atmosphere, temperature of the gas, and exposure time to O2. Deteriorated active carbon was regenerated to nearly initial capacity when heated at 500 C and 730 C in a hydrogen stream and a stream of other gases, respectively.

36798 **APTIC NO. 59436**

Kamino, Yasumi, Shigenori Onitsuka, and Kenji Yasuda

A STUDY ON DESULFURIZATION OF FLUE GASES BY THE ACTIVE CARBON PROCESS USING STEAM DESORPTION (PART 4) - VARIATION OF PROPERTIES OF ACTIVE CARBON USED ON A TEST PLANT. *(Suijoki datsurishiki kasseitanho ni yoru haien datsuryu (daiyonpo)-tesuto puranto unten ni okeru kasseitan no bussei henka). Text in Japanese. Hitachi Zosen Giho (Hitachi Zosen Tech. Rev.), 34(3):14-17, 1973. 7 refs.*

The variation of activated carbon properties for an active process using steam desorption was measured and the relationship between these properties and sulfur dioxide adsorption capacity was examined. A porous structure for the activated carbon developed along with a slight expansion of the BET surface area during a continuous run, and the total oxygen content of the active carbon increased. The O_2 reached 17.6 wt%, being over two times that of the original active carbon after 1200 hr, and existed mainly as surface oxides which were classified into a basic surface group and an acidic surface group for quantitative analysis. The basic surface groups decreased, while the acidic groups increased. The sulfur dioxide adsorption capacity of active carbon did not show a relationship with its structural properties, although it was influenced by the chemical properties of surface oxides. The basic surface group appeared to function as the activation point of chemisorption with oxidation for sulfur dioxide absorption.

36799 **APTIC NO. 59678**

Kanda, Kamekichi

DEVICE TO REMOVE HARMFUL GASES IN SMOKE. *(Baienchu no yugaigasu jokyo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 48-36546. 4p., Nov. 5, 1973. (Appl. Dec. 16, 1970, 1 claim).*

This invention is a wet-type flue gas cleaner featuring multistage scrubbing designed to ensure complete removal of harmful gases. It features a finishing-stage device provided to clean the flue gas as completely as possible. The primary cleaner showers the flue gases with an aqueous solution of detergent at three points during the upward flow of the gas. A secondary cleaner contains two more showers.

36800 **APTIC NO. 60075**

Kawaraya, Toshiya

THE TECHNIQUES OF TREATING THE AIR POLLUTING POISONOUS SUBSTANCES. *(Taiki osen kankei yugai busshitsu shori gijutsu). Text in Japanese. Seikatsu Eisei (J. Urban Living Health Assoc.), 17(4):133-143, April 1973. 5 refs.*

Poisonous gases are eliminated by a wet gas absorption process. The main role of the equipment used for this is to increase the contact area between the gas and liquid as much as possible by dispersing the gas through the liquid. This can be done by a packed tower (PT), spray tower (ST), cyclone scrubber (CS), venturi scrubber (VS), jet scrubber (JS), wetted wall tower (WWT), and gas bubble column. Hydrogen fluoride and silicon fluoride can be eliminated by dissolving them in water using ST, PT, VS, or JT. The HF is collected by treating the solution with calcium hydroxide or sodium nitrate, or by absorption on calcium oxide. Fluorine should be dissolved in 5 to 10% sodium hydroxide. Chlorine can be eliminated by washing with water or alkaline solution, or by adsorption. The WWT is used when the concentration of poisonous gas is high, and PT or ST when it is low.

36801 **APTIC NO. 60070**

Knudson, Robert F.

PORTABLE ELECTROSTATIC AIR CLEANER. *(McGraw-Edison Co., Elgin, Ill.) U. S. Pat. 3,747,300. 6p., July 24, 1973. 7 refs. (Appl. Oct. 14, 1971, 7 claims).*

A portable electrostatic air cleaner has been designed so that the electrostatic air precipitator element can be removed for servicing and thereafter replaced with a minimum of technical expertise and a minimum chance of harm to the person or equipment; the device also includes a mechanical and an activated charcoal filter disposed in sandwiching relation to the precipitator and is constructed to muffle arcing sounds that might eminate from the precipitator. Three tracks are formed on the inner case walls and extend diagonally across the case from an access opening at the rear case wall. The three filters are mounted on the tracks such that the upstream filter is of the mechanical type, the second filter of the electrostatic type, and the downstream element of the charcoal type. The charcoal filter must be in place and the access door must be closed before the unit will operate.

36802 **APTIC NO. 59679**

Kobayashi, Hiroshi

DISPOSAL METHOD OF WASTE GAS CONTAINING HYDROFLUORIC ACID. *(HF ganyu haigasu no shoriho). Text in Japanese. (Otomi Sangyo Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 48-37662. 3p., Nov. 13, 1973. 4 refs. (Appl. June 3, 1966, 1 claim).*

A method for the disposal of waste gas containing hydrofluoric acid produced during the manufacture of phosphate fertilizer and electrolytic manufacture of aluminum is presented. The waste gas containing HF is treated with an acidic solution containing alkaline salt to recover HF as acidic fluorides of alkali, which is neutralized by ammonia to produce both ammonium fluoride and alkali fluoride. The alkali fluoride so obtained is used for neutralizing the free acid formed in the process. The neutralization reproduces the alkaline salt which is recirculated for repeated use in the disposal process.

36803 **APTIC NO. 60142**

Kobayashi, I., S. Murase, T. Inoue, T. Yamada, and Y. Kawamura

A STUDY ON LOW NOX -HIGH LOAD COMBUSTION. *(Tei NOx oyobi kofuka nensho ni kansuru kenkyu). Text in Japanese. Preprint, Combustion Inst. (Japan), p. 131-134, 1973. 3 refs. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 36.)*

A burner was designed to obtain a uniform temperature distribution in the combustion chamber and to reduce the residence time of hot gas. The burner was comprised of refractory ceramic rods surrounded by a refractory metal wire net, all of which were contained in crystalline glass cylinder. The mixture of burner gas and air is burned red hot at the surface of the wire net and a thin combustion film is developed inside it. High heat combustion begins around the ceramic rods which raises the temperature. Temperature distribution in the combustion chamber, effect of primary air on nitric oxide formation, and the residence time of the hot gas were measured. Uniform temperature distribution and low temperature combustion can be performed by this burner while reducing the residence time of the hot gas.

36804 **APTIC NO. 59598**

Koberstein, Edgar and Eduard Lakatos

CATALYST FOR PURIFICATION OF WASTE GASES. *(Laporte Industries, Ltd., London (England) and Deutsche Gold- und Silber- Scheideanstalt, Frankfort (Germany)) U. S. Pat. 3,751,386. 5p., Aug. 7, 1973. 2 refs. (Appl. April 13, 1971, 21 claims).*

The preparation of catalysts used in the oxidation purification of waste gases, particularly in motor vehicle exhaust gases, is described. The catalysts are manufactured by mixing powered calcined oxide of copper and chromium with aluminum oxide or aluminum oxide hydrate, forming catalyst granules from the mixture, and then impregnating the granules with a nickel compound which on calcination will form the catalyst. These catalysts are a considerable improvement on those manufactured by impregnation due to their increased crushing strength. (Author abstract modified)

36805 **APTIC NO. 59703**

Koehler, George R.

OPERATIONAL PERFORMANCE OF THE CHEMICO BASIC MAGNESIUM OXIDE SYSTEM AT THE BOSTON EDISON COMPANY. PART I. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desul-*

furization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/ 2-73-038, p. 579-604. (May 14-17.)

Operational performance is reviewed for the Chemico/Basic Magnesium Oxide System for removal of sulfur dioxide from power plant flue gases at the Boston Edison Company. The scrubbing process which utilizes the sulfur dioxide absorption characteristics of an aqueous slurry containing magnesium oxide, magnesium sulfite, and magnesium sulfate is comprised of five primary operations: an absorption system, a centrifuge system, a dryer system, a magnesium oxide system, and a calcination system. Sulfur dioxide removal efficiencies of 90% or greater have been consistently obtained with SO2 concentrations in the outlet flue being generally 90 ppm or less, and no scaling or pluggage in the venturi absorber has been encountered. Operational problems that have been encountered thus far are: excessive leakage at the seals of the rotary calciner; material handling problems caused by the granular nature of the dryer product; puffing at the feed hood and weigh house caused by balancing the draft requirements of the calcination facility and acid plant; unreactivity in reuse caused by the gritty nature of the calciner product; breakage of the pulverizer as a result of tramp materials in the calciner product; flame obscuring by severe dusting which led to tripping of the flame safety controls and interruption of operations; and an inability to use coke with high ash content. A description of the installed facilities is provided along with plans for future installations.

36806 **APTIC NO. 59582**

Kolb, Richard G.

METHOD AND MEANS FOR REDUCING POLLUTANTS IN EXHAUST FROM INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,747,581. 5p., July 24, 1973. 16 refs. (Appl. Feb. 17, 1971, 2 claims).*

Method and means for reducing pollutants in exhaust from internal combustion engines are described. A portion of the contaminants in the exhaust come from the intake of fuel in droplet, rather than vapor, form. Two cooperating ways of assuring evaporation of the fuel before intake are described. A venturi throat is provided in a passage after mixing of fuel with intake air in a conventional carburetor having a venturi throat. This second venturi throat provides a pressure reduction in the intake mixture following carburetion which causes much of the fuel still in droplet form to evaporate. A low resistance catching filter or screen is placed in the path of the intake mixture after the second venturi throat such as to collect droplets there existing such as those which were too large to be evaporated by the pressure reduction at the pressure reduction throat. These droplets are collected and evaporated in a region of elevated temperature in close proximity to the cylinders while being reduced in volume to be evaporated by the second venturi evaporator. (Author abstract modified)

36807 **APTIC NO. 60137**

Lagerdahl, Sebastian, Kenneth Mascord, and Sten Maartmann

DEVICE FOR ELECTRIC PRECIPITATOR. *(Aktiebolaget Svenska Flaktfabriken, Nacka (Sweden)) U. S. Pat. 3,748,831. 8p., July 31, 1973. 3 refs. (Appl. June 3, 1971, 9 claims).*

A device for controlling the movement of the precipitation electrodes in electrostatic precipitators during hammer cleaning is described. Unlike prior art electrostatic precipitators, the present invention allows for performance of such cleaning at the normal operating voltage of the control device and without uncontrolled oscillations of the precipitation electrodes, thus keeping the electrical voltage distance at an optimal value for the best possible efficiency. Parallel rows of precipitation electrodes are situated between a number of transverse bars disposed at different heights in the precipitator and across it perpendicular to the plane through the rows of precipitation electrodes. The bars have guides opposite each row of precipitation electrodes, and the precipitation electrodes in each row are linked together in the direction of impact. The impact device is designed to strike against the rows of electrodes so as to displace the electrodes one after the other.

36808 **APTIC NO. 59278**

Lardit, F.

PARTICULAR TECHNICAL ASPECTS OF ELECTRIC DUST SEPARATORS, AND ESPECIALLY OF ELECTROSTATIC DUST PRECIPITATORS IN MUNICIPAL WASTE INCINERATORS. *(Aspects particuliers de la technique des depoussiereurs electriques et notamment des electrofiltres en incineration d ordures menageres). Text in French. Rev. Gen. Thermique (Paris), 12(142):999-1012, Oct. 1973.*

Technical and design aspects of electrostatic dust precipitators intended for use in municipal waste incinerator plants are presented. The hot waste gases from the waste incinerator have to be brought to 250-350 C by direct or indirect cooling with heat recovery, or by dilution with fresh air for dust separation in electrostatic precipitators. As electrostatic precipitators are unable to retain light pieces of burned paper, such flakes should be removed before the gas enters the dust separator. Relative increases in the unburned matter content in the dust leaving the electrostatic precipitator as compared with the unburned matter content at the inlet was determined. As the errors involved in the determination of the efficiency of electrostatic dust precipitators are in the order of magnitude of 20%, electrostatic dust separators should be designed for a residual dust concentration of 120 mg/N cu m instead of the adopted maximum allowable concentration of 150 mg/N cu m, or for an efficiency of 99.2% instead of 99%. Multisectional electrostatic precipitators have positive advantages before single-section designs for reliability.

36809 **APTIC NO. 59807**

Lardit, F.

INDUSTRIAL DUST SEPARATION. *(Le depoussierage industriel). Text in French. Pollut. Atmos. (Paris), 15(10):407-414, Oct.-Dec. 1973. (Also: Revue Chauffage, Ventilation et Conditionnement, April, May, and Sept. 1973).*

The different categories of industrial dust separators and their fields of use are described. Mechanical dust separators exploit gravity, inertia, or centrifugal forces for dust separation. Settling chambers with an without baffles, cyclones, multicyclones with axial or tangential inlets, electrostatic precipitators, porous-layer filters (such as tissue filters), and hydraulic dust separators (such as scrubbers, spray towers, and bubblers), are the principal types of industrial dust separators. The respective cut-off limits for cyclones and high-efficiency multicyclones are about 20 micron and 5 micron, respectively, while the efficiencies range from 75% to 95%. They are used mainly for boilers, industrial furnaces, cement works, and pneumatic conveyor systems. Electrostatic dust precipitators, utilizing the corona effect and the electric field between electrodes, are used for dust separation in thermal power plants, metallurgy, cement works, waste incinerator plants, and in the chemical industry. The use of hydraulic dust separators, also suitable for the removal of gaseous components, is limited by the need for waste water treatment.

36810 **APTIC NO. 60051**

Leas, Lawrence, Robert L. Leas, and Cecil J. Johnson

POLLUTION CONTROLLER. *(Leas Brothers Development Corp., Columbia City, Ind.) U. S. Pat. 3,751,906. 5p., Aug. 14, 1973. 5 refs. (Appl. Feb. 22, 1972, 5 claims).*

A method for decreasing or eliminating exhaust emissions of nitrogen oxides, hydrocarbons, carbon monoxide, or the like is described. The combustion temperature is maintained at a sufficiently low level to prevent the formation of NOx. The exhaust gases are reacted with a metal oxide for the removal of contaminants, unburned HC, and CO. The metal oxide reacts with HC and CO to produce water vapor and carbon dioxide and at low temperatures with sulfur dioxide. This eliminates the corrosion and catalytic poisoning problems with SO_2 within the catalytic afterburners and muffler in automotive emission control systems. Prior methods which decreased combustion temperature to decrease NO_x increased HC and CO if excess fuel was used to decrease combustion temperature. In the present invention, both cooling fluid through the coils in the combustor and excess fuel can be used to decrease NO_x while the HC and CO are removed downstream by chemical reactions with the higher metal oxide. In addition, the reactions removing the HC and CO are exothermic so that this heat is recovered as power passing through a gas turbine prior to exhausting to the atmosphere. Therefore, the overall specific fuel consumption is not increased as compared to present day configurations that eliminate some of the pollutants from the exhaust. (Author abstract modified)

36811 **APTIC NO. 59428**

Lewis, John A.

ENGINE EXHAUST GAS RECIRCULATING CONTROL. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,768,452. 4p., Oct. 30, 1973. 6 refs. (Appl. April 4, 1972, 9 claims).*

A system for controlling the recirculation of exhaust gases back into an automobile engine through the intake manifold and thus reducing the emission of unburned hydrocarbons and oxides of nitrogen has been developed to do so by means of a pilot valve type operation rather than by the single control valve known in the prior art. The device also provides selective control of exhaust gas recirculating flow of the engine in response to changes in intake manifold vacuum level, in contrast to control by changes in carburetor spark port vacuum level. A duct is provided for connecting the exhaust gas crossover passage to the intake manifold. The duct is normally closed by a valve that is opened by manifold vacuum. An air-bleed device that is normally closed and opened against a spring force by manifold vacuum above a predetermined level is provided so that the opening signal force of the gas recirculating valve varies directly with manifold vacuum below the predetermined level and inversely above the level to prevent recirculation during engine idle and cruising and wide-open throttle operation while providing controlled operation in the range between. (Author abstract modified)

36812 **APTIC NO. 59859**

Ligutom, Angelo Y.

OLAN SMOG DEVICE. *(Assignee not given.) U. S. Pat. 3,742,682. 5p., July 3, 1973. 4 refs. (Appl. March 19, 1971, 3 claims).*

A water scrubbing device for neutralizing and removing poisonous components in automobile exhaust gas has been developed as an alternative to other well-known emission control devices. Engine exhaust gases entering a tank are directed downwardly and then passed upwardly through a liquid (water) spray for combining of gas impurities with water molecules before being exhausted from the outer end of the device. A motor-driven pump which is located externally from the tank circulates the liquid, and a baffle adjacent the exhaust gas inlet directs the gases downward toward the level of the water so that the gases flow upward through a foraminated sheet and water spray before discharge through the exhaust outlet.

36813 **APTIC NO. 60033**

Lowicki, Norbert and Gernot Hanig

PROCESS FOR REMOVING SULFUR COMPOUNDS FROM GAS. *(Grillo-Werke A.G., Duisburg-Hamborn (West Germany)) U. S. Pat. 3,761,570. 8p., Sept. 25, 1973. 5 refs. (Appl. Dec. 17, 1969, 24 claims).*

A process is described for removing sulfur compounds from gases by contacting the gas with an aqueous suspension of a hydrolyzed admixture of an amphoteric component, more particularly an oxide, hydrated oxide, or hydroxide of aluminum, zinc, iron, or manganese, and a basic component, more particularly an oxide or hydroxide of an alkali metal or alkaline earth metal. This process can be used to remove sulfur dioxide and other sulfur compounds from industrial waste gases, especially flue gases. In this new process, the absorbent is brought into contact with the waste gases as an aqueous suspension. The suspension is recycled to the absorption stage after separation from the treated waste gas stream at temperatures up to 110 C. The absorbent is separated from the aqueous suspension and regenerated. No separate hydration of the absorbent is necessary. (Author abstract modified)

36814 **APTIC NO. 60063**

Mare, Ernest

SCRUBBING APPARATUS AND METHOD. *(Assignee not given.) U. S. Pat. 3,745,745. 7p., July 17, 1973. 4 refs. (Appl. Jan. 28, 1972, 5 claims).*

A gas scrubber with superior separating action has been designed upon the principle that improved scrubbing action can be obtained when the gas flow is divided into several streams which are directed downwardly against the surface of a liquid body. Each nozzle of the scrubber has a shield which overlies the liquid body and confines the movement of gas and entrained liquid from the region of impingement with the liquid. The nozzles and their shields are arranged in a cluster within a reservoir; and the flow velocity is such that depressions are formed in the liquid body immediately below the nozzles, effecting some initial scrubbing action. The impingement causes some of the liquid to be entrained in the gas flow whereby a gas-liquid mixture flows outwardly in a radial direction from the region of each depression and through the spaces underlying the shields. The gas-liquid mixture discharging from the region of each depression is caused to intermingle with the gas-liquid mixture discharging in an opposite direction from at least one adjacent nozzle, thereby causing further turbulence and scrubbing action. (Author abstract modified)

36815 **APTIC NO. 59661**

McAuliffe, C. A.

THE HYDROGEN ECONOMY. *Chem. Brit., 9(12):559-563, Dec. 1973. 12 refs.*

Synthetic hydrogen has been receiving attention as a replacement for petroleum and natural gas fuels. Plants can electrolytically produce H_2 with 60-70% efficiency. Open-cycle thermochemical reactors of the type which involve reforming petroleum naphthas and partial oxidation of hydrocarbons are used at present to produce H_2. Closed-cycle processes are Carnot-limited. Storage of gaseous H_2 should not present any greater problems than the storage of coal gas or natural gas. Large quantities of liquid H_2 can be stored safely with only small evaporation losses. It may be possible to store H_2 as metal hydride. Hydrogen gas can be used for all purposes for which natural gas is used. It can also be used in the chemical industry, for direct reduction of ores, in synthetic fuels, to generate electric power, as a fuel for vehicles, and as a fuel for gas turbines. Safety, transmission, and storage of hydrogen are mentioned. The advantages of H_2 include: it comes from an inexhaustible source, water; it is nonpolluting; it can replace all fuels; no new technology is needed to transport H_2 in underground pipes; storage of H_2 as a liquid, gas, or metal hydride will give flexibility to the energy supply; and the other product of electrolysis is oxygen, which has many potential uses.

36816 **APTIC NO. 59702**

McGlamery, Gerald G.

MAGNESIA SCRUBBING. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 553-577. (May 14-17.)*

An intensive design and cost study was performed for magnesia scrubbing-regeneration processes for sulfur oxides removal from power plant stack gas. Conclusions derived from the study were: sulfur dioxide absorption by the process is effective, with major portions of the system utilizing proven technology; magnesia scrubbing is not effective for nitrogen oxides removal from power plant stacks; equipment for commercial systems is available from vendors and fabricators; although achievable net sales revenue for recovered 98% sulfuric acid will probably average only $8-12/ton over the next decade, there will be applications where better netbacks are obtainable; primary economic factors are investment, product volume, net sales revenue, competitive cost of alternatives, and basis of financing; magnesia systems, under total regulated financing, are competitive with limestone scrubbing on large (400 MW or greater) power units; total nonregulated industry financing and operation appear unlikely; a cooperative venture between several power companies and a chemical company, with each employing capital for and operating their portion of the process, appears to be a good means to fund a magnesia system; interest in the magnesia scrubbing regeneration process has thus far centered more on replacement of sulfur as raw material in existing sulfuric acid plants with existing markets rather than for added capacity to meet increasing acid markets; there are a limited number of locations that can support a central process installation; total process cost is not greatly affected by cost of process material shipping, although at distances over 100 mi the cost becomes much more significant; at at least one large-scale demonstration of the system is underway, with the process already having been tested in laboratory and pilot plant stages.

36817 **APTIC NO. 59699**

McKinney, B. G., A. F. Little, and J. A. Hudson

THE TVA WIDOWS CREEK LIMESTONE SCRUBBING FACILITY. PART I. FULL SCALE FACILITY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 475-494. (May 14-17.)*

The design of a limestone slurry scrubbing system for the Tennessee Valley Authority s Widows Creek Unit 8 (550 MW plant) for removal of sulfur dioxide from generating plant stack gases is presented. The flue gas after exiting the existing electrostatic precipitators passes through a fan, venturi, liquid gas separation chamber, absorber, entrainment separator, and a reheater for each train into an existing stack. Flue gas bypass ducts are provided around each scrubber train to prevent an undue amount of boiler downtime because of scrubbing system malfunctions, particularly during the initial shakedown operation of the system. A plenum connecting the inlet ducts to four fans is provided to permit operation of up to 75% load with one of the scrubbing trains out of the service. Limestone slurry, pond water recycle, and make-up river water are added to an absorber circulation tank, and slurry is pumped from the absorber circulation tank into the absorber and drains back into the tank. The recycle pond water is regulated to maintain the solids concentration level, about 10% by weight, in the absorber circulation tank. The absorber circulation tank overflows into a venturi circulation tank from which slurry is pumped to the venturi and drains from the separation chamber back into the circulation tank. The solids concentration in the venturi circulation tank is dependent upon the inlet flue gas fly ash loading but will normally run about 15%. Estimated capital cost is $42,000,000, not including a portion of the solids disposal costs. Estimated operating cost is approximately 2.9 mills per killowatt hour generated.

36818 **APTIC NO. 60050**

McNeely, Charles D.

AIR SCRUBBER. *(Assignee not given.) U. S. Pat. 3,751,885). 8p., Aug. 14, 1973. 6 refs.*

An air scrubber for removing and selectively incinerating the condensable contaminants from the exhaust stream of a ventilating system is described. A generally localized surface area is provided within a collection chamber such that the exhaust stream can flow turbulently around, and contaminants can condense on the surface. A cooling means may be provided to maintain a temperature differential between the surface area and the exhaust stream in order to facilitate condensation. Gates are periodically closed to maintain the collection chamber discrete from the remainder of the ventilating system. When the gates are closed, a communicating means directs a cleaning medium across the surface area to remove accumulated contaminants. The mixture of cleaning medium and contaminants is collected and separated so the cleaning medium can be recycled. The contaminants are then either collected for removal or conducted into an incinerator. The products of the incineration preferably pass through a second combustion area which serves as an afterburner to eliminate all unburned hydrocarbons or other pollutants. A number of approaches have been tried to remove the deposit of flammable materials that accumulate within ventilating systems. Most are rather complex, and all require a further means to store contaminants for periodic removal or to move them into an available cleaning system. The present system removes the contaminants from the vaporous exhaust discharge of a ventilating system in a simpler, more efficient manner than previous methods. (Author abstract modified)

36819 **APTIC NO. 59498**

Miller, Kenneth J.

FLOTATION OF PYRITE FROM COAL: PILOT PLANT STUDY. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, Rept. RI 7822, 18p., 1973. 2 refs.*

Pittsburgh bed and Lower Freeport bed coals were tested in the Bureau of Mines two-stage froth flotation pilot plant which utilizes a new flotation process to remove pyritic sulfur. The process consists of a first-stage coal flotation step to remove coarse, free pyrite and other refuse in the tailings; clean coal froth concentrate is then repulped and treated with a coal depressant, a pyrite collector, and a frother to selectively float the remaining pyrite in a second stage. Pilot results were excellent and compared well with those obtained in laboratory batch tests. About 70% of the pyrite present in the Pittsburgh bed coal and about 90% of the pyrite present in the Lower Freeport bed coal were removed with excellent final clean coal recoveries. (Author abstract modified)

36820 **APTIC NO. 59708**

Miller, W. E.

THE CAT-OX PROJECT AT ILLINOIS POWER. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 673-686.*

Application of a catalytic oxidation method for removing sulfur dioxide from fossil fuel generating station flue gas to a 100 MW unit of the Illinois Power Company is described. Operation of the system consists basically of the following six separation phases: fly ash collection, conversion of SO2 to sulfur trioxide, heat recovery, removal of sulfuric acid, acid mist elimination, and acid storage and loading. The temperature of the flue gas leaving an electrostatic precipitator must be reheated to 850 F to allow 90% conversion of SO2 to SO3. The system is designed for a flue gas flow rate of 1,120,000 lb/hr which is equivalent to a load of about 110 MW and close to the nominal 100 MW rating of the Illinois Power Company unit. The power company unit burns approximately 275,000 tons of coal per year with a sulfur content of 3.1%, and the Cat-Ox system theoretically should produce about 19,000 tons/yr of equivalent 100% sulfuric acid. The system is expected to remove 85% of the SO2 from the flue gas as 78% sulfuric acid and to remove essentially all of the fly ash.

Capital costs for design and construction are an estimated $7,300,000.

36821 **APTIC NO. 59712**

Minnick, L. John

FIXATION AND DISPOSAL OF FLUE GAS WASTE PRODUCTS: TECHNICAL AND ECONOMIC ASSESSMENT. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 835-873. (May 14-17.)*

Opportunities available for conversion of power plant waste materials through suitable processing steps to stabilized structural fill material or to usable manufactured by-products are outlined, and a conversion process based on a modification of Poz-O-Pac dealing with stabilization or beneficiation of fly ash is presented. The conversion system is adaptable to power plants as a retrofit application or to new installations, although it is not applicable to oil-fired operations since it depends on the availability of fly ash. Ratios of ash to sulfur oxide sludges that are produced in the average coal-burning operation fall within the ranges that can be utilized for the manufacture of the various compositions. Cost evaluations indicate that for a full-sized plant the conversion system is usually competitive with costs that would be incurred simply by transporting the waste material to dumps or lined lagoons. (Author summary modified)

36822 **APTIC NO. 59680**

Miura, Mitsugu

GAS CLEANER. *(Kitai no seijo sochi). Text in Japanese. (Miura Engineering International Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 48-42907. 4p., Dec. 19, 1973. (Appl. April 27, 1970, 1 claim).*

A wet-type gas cleaner designed to remove, absorb, or separate such impurities as dust particulates, sulfurous acid gas, and hydrochloric acid gas from a gas such as air is described. It features high removal efficiency with minimal use of scrubbing or absorbent liquid. Basically, it is a vertical double-tube structure; the inner tube is provided with two groups of tangential slits, the lower group serving as the inlet and the upper group serving as the outlet. As a gas is fed into this device at a high flow speed of 10 m/sec, 20 m/sec, or 30 m/sec from the bottom, it goes into the inner tube through the lower tangential slits and then moves upward, turning very rapidly until it is discharged through the upper tangential slits. The scrubbing liquid stored in the bottom of the device is automatically sucked into the inner tube through the bottom by the rapidly moving gas and becomes liquid membranes which ascend together with the gas along the inner wall of the inner tube, and an effective liquid-gas contact is maintained. A similar liquid-gas contact is also achieved when the atomized liquid membranes are discharged with the gas through the upper tangential slits. More basic units may be combined with the first one for more thorough removal of the impurities.

36823 **APTIC NO. 59376**

Miyamoto, Takao, Katsuo Oshikiri, Shigeru Shinkai, and Koichi Takahashi

DEODORIZATION OF KRAFT PULP MILL. *(Kurafuto parupu kojo no dasshu sochi). Text in Japanese. Ebara Jiho (Ebara Times), no. 85:32-38, Nov. 1973.*

The environmental standards for bad odors, the relationship between bad odor substances and olfactory senses, physical and chemical properties of bad odor components, odor gas formation processes, odor emission sources, and deodorization methods are discussed. Odor gases are usually cooled directly or indirectly for draining. The indirect method is expensive initially, but the amount of condensation is limited, and the odor concentration in the drainage is high; therefore the operation cost is low. In spite of high operation cost, the direct contact cooling method is more advantageous from the standpoint of maintenance. For combustion treatment of odor gases, there is always the danger of explosion. This is controlled by a water trap, rupture disk, or flame arrester. The water trap method safeguards against flame backfire by supplying gas several cm below the water surface. The rupture disk is installed in the pipe system or in the water trap. When the pressure in the pipe grows out of ordinary due to an explosion, the disk will break and act as a safety valve. The flame arrester is a metal screen installed in the pipe, forming narrow channels. Since flames do not move on in small pipes of diameters less than 2 mm, backfired flames are stopped at the metal screen. The example of the combustion system at a paper manufacturing plant in Fuji city is discussed. The relief gas from the batch pulp caldron and the blow gas from the blow tank are drawn separately and eventually led to the rotary kiln. First the gas is cooled by direct contact and sent to the water trap. A fan sends the gas to the flame arrester and then to the burner. Then the gas goes to the kiln and, mixed with fuel, it is completely burned. The odor gas concentration at the entrance of the kiln is already 1/10 of the original concentration, and it drops drastically by thermal degradation. Drain vacuum stripping methods are described.

36824 **APTIC NO. 59811**

Moet, H., J. Chaon, and M. Huysman

PRINCIPAL ASPECTS OF AIR AND WATER POLLUTION CONTROL AT THE DUNKERQUE INDUSTRIAL PLANT. *(Principaux aspects de la lutte contre la pollution atmospherique et la pollution des eaux a l usine de Dunkerque). Text in French. Rev. Met. (Paris), 70(11):861-865, Nov. 1973.*

Problems of air and water pollution as well as measures taken for their abatement at the Dunkerque industrial agglomeration, including cokery, foundry, steel mill, and rolling mills, are described. The gases and dusts generated during charging in the cokery are collected, incinerated, and washed. The ammonia extracted from the cokery gas is destroyed by combustion with excess air and the discharged gas is colorless and practically free from nitrous gases. The furnaces are fired with coke gas which causes practically no air pollution. The foundry waste gases are passed through high-efficiency electrostatic precipitators which reduce the residual dust content to below 0.1 g/cu m. The waste gases from the oxygen-steel smelting process, containing up to 10 g of dust/cu m along with carbon monoxide, are scrubbed prior to incineration. The residual dust concentration is less than 0.1 g/cu m.

36825 **APTIC NO. 59595**

Morrison, Joseph N., Jr.

POLLUTION CONTROL SYSTEM FOR DISCHARGING OPERATIONS OF COKE OVEN. *(Dravo Corp., Pittsburgh, Pa.) U. S. Pat. 3,746,626. 4p., July 17, 1973. 6 refs. (Appl. Nov. 5, 1970, 7 claims).*

An apparatus and method is detailed for effecting pollution control for a coke oven battery during the coke removal operation, and the transporting of the coke to the next processing area. The system is effective and economical and can be used with existing or proposed coke oven batteries. A canopy is extended over the area which contains the coke and the exhaust and exhaust manifold are connected to the canopy. A plurality of individually operable dampers are spaced along the travel path of the coke, and a damper control system is provided. The control system is actuated through predetermined dampers which are disposed to connect the exhaust manifold to the canopy. The rest of the dampers remained closed. Substantially, all the evolved pollutants are collected via the dampers and the exhaust manifold for processing. (Author abstract modified)

36826 **APTIC NO. 60204**

Naber, Jaap E.

PROCESS FOR THE REMOVAL OF SULFUR TRIOXIDE FROM INDUSTRIAL OFF-GASES. *(Shell Oil Co., New York) U. S. Pat. 3,755,535. 7p., Aug. 28, 1973. 7 refs. (Appl. Sept. 16, 1971, 15 claims).*

A process for removing sulfur trioxide from industrial off-gases containing sulfur oxides is described. The gases are contacted at an elevated temperature with a solid acceptor comprising an inorganic oxide which is substantially free of deposited metals or metal compounds, and the loaded acceptor is regenerated with a hydrogen sulfide-containing gas. Optionally, the sulfur compounds, in the off-gases may first be oxidized to SO3 prior to contacting with the solid acceptor. Previous dry adsorption processes based on the use of solid acceptors were effective for removal of sulfur dioxide and sulfur trioxide, but were inexpensive because of the cost of metals in the metal oxides used as the adsorbent and because of the cost of the hydrogen or hydrocarbon reducing gas employed for regeneration. The present process provides an efficient and highly economical method for removing SO3 and for regenerating the solid acceptors. (Author abstract modified)

36827 **APTIC NO. 59962**

Nakagawa, Tsutomu

POLYMER MEMBRANES FOR REMOVING GAS, ITS FUNCTION AND APPLICATION. *(Kitai bunriyo kobunshimaku no kino to oyo). Text in Japanese. Purasuchikkusu (Japan Plast.), 24(12):9-23, Dec. 1973.*

The history and state-of-the-art of polymer membrane filters is given. Theoretical explanations of the magnitudes of gas permeation coefficients for non-porous homogenous membranes are given. A model of a gas-separating plant using non-porous homogenous membranes is described. Gas separation by non-porous homogenous and heterogeneous membranes is explained. Mechanisms of microporous membranes are described. Polymer membranes can be used to separate helium from natural gas, remove sulfur dioxide from stack gases, remove odors, separate and recover hydrogen from stack gases, and separate oxygen and nitrogen.

36828 **APTIC NO. 60100**

Nishimura, Michiko

STUDIES ON THE ELIMINATION OF BAD ODORS. 7. THE DATA ON SOLUBILITY AND PHASE EQUILIBRIUM OF ILL-SMELLING SUBSTANCES AND THE LOCATION OF THEIR LITERATURE. *(Akushu jokyo ni kansuru kenkyu. 7. Akushu busshitsu ni kansuru yokaido oyobi so-heiko deita to sono shozai bunken ichiranhyo). Text in Japanese. Osaka-fu Taiki Osen Boshi Gijutsu Shiryo (Data Prevent. Air Pollut. Osaka Prefect., no. 9:76-102, April 1973. 312 refs.*

Scrubbing water or solvents is an effective means of removing odorous gases such as acetone, acrolein, ammonia, butylene, hydrogen sulfide, amines, and mercaptans. Mathematical formulas are given for the solubility of various solvents and for phase equilibrium data. Data is given for the removal of various odors by various types of scrubbers running under various conditions.

36829 **APTIC NO. 59858**

O Dell, Leonard J. and William R. Hamilton, Jr.

TUBULAR GAS FILTER APPARATUS. *(Assignee not given.) U. S. Pat. 3,747,305. 3p., July 24, 1973. (Appl. not given, 7 claims).*

A releasable connecting arrangement for attaching one end of a filter bag to the aperture of a plenum defining plate member has been designed to provide an economical and straight forward arrangement which can be manufactured with a minimum of parts and steps and which permits more rapid filter bag connection and release than prior art designs. The connector consists of a flexible band member which has an outer diameter slightly less than the diameter of the aperture to which the bag end is connected and a soft, expansible, resilient collar surrounding and engaged to the outer face of the band member. The resilient collar cooperates with one end of the filter bag to hold the filter in the aperture of the plate member.

36830 **APTIC NO. 59667**

Okamoto, Yukihiko, Tsuneo Sugitani, and Tetsuya Nakahira

SULFUR RECOVERY DEVICE. *(Iwo kaishu sochi). Text in Japanese. (Ishikawajima-Harima Heavy Industries Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-16117. 2p., May 8, 1973. (Appl. Sept. 5, 1967).*

This device is designed to manufacture sulfur from hydrogen sulfide produced during a petroleum or natural gas refining process, thereby preventing exhaust of H2S or sulfurous acid gas. The most popular S recovery method today is the gas-phase oxidation method, but it requires extensive floor space and equipment, thus making it economically disadvantageous. The new device designed to solve this problem offers a more compact and effective S recovery process. Hydrogen sulfide undergoes an oxidation reaction in which it reacts with oxygen in air while the sulfur dioxide formed by this oxidation reaction gives the Claus reaction as it reacts with the remnant H2S. The first reaction is very rapid while the second is very slow and takes place as a catalytic reaction at a temperature of 200 C or higher. The equilibrium constant of the second reaction is close to 1, so that it is necessary to separate by condensation the S formed during the reaction. This device is developed from utilization of these reaction mechanisms. A tubular tower with an interior which is horizontally divided into several sections is described. Hydrogen sulfide and O2 are fed into the first combustion chamber where they give the first reaction and part of the second reaction. The gas so produced gives part of its reaction heat to the heat recovery coils provided and goes through the cooling coils provided around the temperature adjuster tank located above the combustion chamber. Sulfur separated at this stage is discharged out of the tower. The gas then flows upward through the heating coils provided in the central portion of the tank and is heated for the necessary reaction. It continues in o the catalytic layer above which the second reaction is continued and the S produced is discharged. The gas so treated is finally burned in the second combustion chamber before being discharged into the atmosphere.

36831 **APTIC NO. 59864**

Olson, Rodney I.

ELECTROSTATIC MIST PRECIPITATOR. *(Assignee not given.) U. S. Pat. 3,750,373. 4p., Aug 7, 1973. 6 refs. (Appl. Oct. 1, 1971, 1 claim).*

An electrostatic precipitator for removing mist from a gas stream is described. The precipitator is formed of electrical insulating material, typically resin impregnated glass fiber. The precipitator has a plurality of tubular flow passages, each having a rod conductor within the tube and another conductor within the tube wall. A helical wire conductor is embedded between the resin impregnated glass fiber layers to form a tubular flow passage. Because of its construction material, the precipitator can be used with corrosive gases and liquids, unlike conventional precipitators. The precipitator operates in the same manner as conventional precipitators, but has a substantially longer operating life and longer operating period without maintenance. (Author abstract modified)

36832 **APTIC NO. 59342**

Ottofy, Frank B.

ANTI-POLLUTION DEVICE FOR AND METHOD OF REMOVING OIL FROM AIR VENTED FROM THE CRANKCASE OF AN INTERNAL COMBUSTION ENGINE AND RETURNING THE OIL TO THE CRANK-

CASE. (Assignee not given.) U. S. Pat. 3,765,386. 4p., Oct. 16, 1973. 5 refs. (Appl. June 16, 1971, 9 claims).

An anti-pollution device and method for removing oil from air vented from the crankcase of an internal combustion engine and returning it to the crankcase have been developed to reduce carbon monoxide and other exhaust increases usually associated with feeding the oil vapors back to the intake manifold; the method also decreases spark-plug fouling. The device consists of an elongated casing packed with wire mesh and having an inlet at one end which is connected to the positive crankcase ventilation valve and an outlet at the other end which is connectible to the intake manifold. An oil detection final filter is provided near or at the outlet end of the casing. A drain outlet for oil removed from the oil-laden air drawn through the wire mesh is provided and includes a check valve which is closed during operation of the engine and open for oil drainage purposes when the engine is shut off. (Author abstract modified)

36833 **APTIC NO. 60199**

Peltomaki, Olavi

DEVICE FOR BETTER EXPLOITATION OF THE EXHAUST ENERGY FROM AN INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,759,040. 5p., Sept. 18, 1973. 8 refs. (Appl. Oct. 1, 1971, 6 claims).*

A device for better exploitation of the exhaust gas energy from an internal combustion engine equipped with poppet valves, in particular for an exhaust gas driven compressor, is discussed. Subsequent to a narrow continuation succeeding the sealing point of the valve seat, an annular opening is provided to which air is supplied at atmospheric pressure or under appropriate pressure. The opening as well as the upper surface of the valve and the inner surface of the valve seat are shaped so that an ejector is formed in which the exhaust gases flowing at high speed pick up air that has been supplied to the opening. (Author abstract)

36834 **APTIC NO. 59471**

Postma, Norman D., Rob Van Giessel, and Frits Reinink

THE STIRLING ENGINE FOR PASSENGER CAR APPLICATION. *Preprint, Society of Automotive Engineers, Inc., New York, 23p., 1973. (Presented at the Society of Automotive Engineers, Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, Ill., June 18-22, 1973, Paper 730648.)*

A detailed theoretical and experimental study program conducted by Ford Motor Company and N. V. Philips of Holland is described for performance and emission tests on a 170 brake hp Stirling engine which was designed for a 1972 Ford Torino. The Stirling engine employed was different from conventional piston engines in that heat was added by an external flame through a heat exchanger (heater head) to the working gas inside the engine rather than being supplied by burning a quantity of fuel inside the chamber. Results of CVS (constant volume sampling) testing, using a dynamometer to simulate low mileage performance, indicated that hydrocarbons, carbon monoxide, and oxides of nitrogen were all well below the 1976 standard, their values in g/mi being respectively 0.20, 1.20, and 0.14.

36835 **APTIC NO. 59765**

Princiotta, Frank

EPA PRESENTATION ON STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY - NATIONAL POWER PLANT HEARINGS. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Control Systems Lab., 66p., Oct. 18, 1973.*

An assessment of flue gas desulfurization (FGD) processes in the United States and Japan was made and resulted in the following conclusions: the technology represents a viable means of achieving power plant sulfur dioxide control while allowing the use of plentiful high sulfur fuels; no alternative control technology is expected to make a major impact before 1980; the technological feasibility of flue gas desulfurization systems has been established, and costs are comparable to low-sulfur cost increments; a large fraction of the nation s coal-fired power plants can be fitted with commercially available FGD systems and meet SO2 requirements; the required reliability of FGD systems has been achieved on selected units; and, although disposal of sludges from some FGD systems can potentially lead to environmental problems, technology is available which appears to alleviate any water pollution and land utilization problems. (Author summary modified)

36836 **APTIC NO. 60106**

Psyras, Hippocrates G. and Arther Angelo Bellisio

GAS PURIFICATION SYSTEM. *(GAF Corp., New York) U. S. Pat. 3,745,747. 11p., July 17, 1973. 4 refs. (Appl. March 25, 1971, 20 claims).*

A method for the recovery of N-alkylated lactams, particularly N-methyl pyrrolidone, which serve as absorbing solvents in the sweetening and dehydrating of natural gases and for selective solvation of various components from mixed gas streams is presented. The entrained lactams are recovered by contacting the gas stream with a solvent for the lactams having a boiling point higher than that of the lactam being recovered. Intimate contacting of the gas stream with the liquid solvent results in abstraction and dissolution of substantially all the entrained lactam. The solvent containing the lactam is collected and removed from the gas stream, and the N-alkylated lactam is then separated from the liquid. The lactam and the solvent are each recovered and recycled for their specific purposes. Suitable solvents for the recovery include: tri and tetraethylene glycols and the higher boiling N-alkyl pyrrolidones, including N-cyclohexyl pyrrolidone. (Author abstract modified)

36837 **APTIC NO. 59704**

Quigley, Christopher P.

OPERATIONAL PERFORMANCE OF THE CHEMICO MAGNESIUM OXIDE SYSTEM AT THE BOSTON EDISON COMPANY. PART II. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 605 617. (May 14-17.)*

Operational performance and investment and operating costs are reviewed for the magnesia scrubbing system on Boston Edison Company s Mystic Unit No. 6. The scrubber has shown consistently high removal levels of sulfur dioxide from the flue gas, and the sulfites produced have been successfully calcined at the acid plant. Sulfur dioxide liberated in the calciner has been used to make 98% commercial grade acid, and the regenerated magnesium oxide has been reused successfully in the scrubber for short periods of time. The scrubber has also remained free of scaling and plugging problems. The equipment and processes, however, have failed to demonstrate a reasonable availability commensurate with power plant equipment needs, and the total scrubber operating time during the first year of operation has not exceeded 1200 hr. Availability has been a very low 17%, and the longest sustained run has been 4 1/2 days. Tables of investment and operating cost estimates are provided.

36838 **APTIC NO. 59835**

Quinn, Ronald E.

REGENERATIVE GAS TURBINE SYSTEM. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,742,702. 5p., July 3, 1973. 12 refs. (Appl. Jan. 22, 1971, 3 claims).*

A regenerative gas turbine engine has been designed to reduce nitrogen oxide formation associated with similar prior art engines by providing for controlled variation of the ratio of air bypassing the regenerator to that flowing through it so as to maintain maximum efficiency of regeneration consonant with minimization of NOx generation as load varies. A conventional combustion liner has a compressor connected to the combustion apparatus for supplying primarily air which is unheated by the regenerator to the combustion zone of the liner and primarily air which is heated by the regenerator to the dilution zone of the liner. An adjustable valve provides for varying the ratio of unheated to heated air. (Author abstract modified)

36839 **APTIC NO. 59692**

Raben, I. A.

STATUS OF TECHNOLOGY OF COMMERCIALLY OFFERED LIME AND LIMESTONE FLUE GAS DESULFURIZATION SYSTEMS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 133-186. 9 refs. (May 14-17.)*

The status of technology for commercially offered lime/limestone sulfur dioxide removal processes has been evaluated. Most commerial system suppliers guarantee 80 and 90% removal efficiencies using limestone and lime scrubbing, respectively. Liquid-to-gas ratio has increased from 20-30 to 40-80 gal/1000 cu ft between 1970 and 1973, and stoichiometry has decreased from 1.7 to as low as 1.2; the new values for both parameters tend to make designs more reliable and free of scaling. There are 21 full- size units being designed or constructed, although the number of SO2 removal systems (using alkali addition into the scrubber) operating for any period of time is quite limited. The capital cost of a 500 megawatt unit with the use of limestone is estimated at $45/kw, and a typical operating cost with limestone is an estimated 23-25 cents per million Btu. New SO2 removal systems using lime will cost $38/kw, with a typical annual operating cost of 23 cents per million Btu. Areas requiring further study and evaluation are reliability and solid waste disposal. (Author summary modified)

36840 **APTIC NO. 60213**

Rasch, Rudolf

DRY BINDING OF POLLUTANTS IN FLUE GASES. *(Zur trockenen Bindung von Schadstoffen in Rauchgasen). Text in German. CZ-Chem.-Tech., 2(10):403-406, Oct. 1973. 10 refs.*

Methods for and reaction mechanisms involved in the dry absorption of the flue gas components sulfur dioxide and hydrochloric acid are presented. In brown coal-fired power plants, about 40% of the SO2 formed is bound by alkaline fly ash. The rest can be efficiently absorbed by such additives as ferric oxide, especially in the form of maghemite, calcia, and magnesia in a temperature range of 400-500 C. Sulfites are not formed due to the SO2 concentration in the flue gas being too low. Calcia and calcium carbonate are suitable for the absorption of hydrochloric acid as generated in waste incinerator plants handling polyvinyl chloride at temperatures below 350 C.

36841 **APTIC NO. 59597**

Richards, John H.

CHARGING AISLE EXHAUST SYSTEM. *(Robertson (H. H.) Co., Pittsburgh, Pa.) U. S. Pat. 3,747,909. 6p., July 24, 1973. 1 ref. (Appl. Dec. 27, 1971, 7 claims).*

An exhaust system is described for preventing release to the atmosphere of the large volume of pollutants produced in the charging aisle during the introduction of a hot charge and a cold charge into a high temperature furnace, such as a basic oxygen furnace. The exhaust system provides a shaft directly above the charging aisle and adjacent to the furnace. The shaft directs the pollutants from the charging aisle to suitable exhaust means which direct the pollutants to pollution control apparatus. Other systems which use the exhaust stack during the purification cycle also use a hood which extends over the open top of the furnace. This arrangement has not been successful. Only about 40% of the emitted pollutants are captured by the hood, while the remaining 60% are discharged into the atmosphere. (Author abstract modified)

36842 **APTIC NO. 59647**

Robinson, Philip W.

REACTIVE WASTE GAS TREATING DEVICE. *(Assignee not given.) U. S. Pat. 3,751,227. 6p., Aug. 7, 1973. 2 refs. (Appl. Nov. 4, 1971, 11 claims).*

An invention is described for treating waste gases to reduce the percentage of harmful components discharged to the ambient air without creating large quantities of wash water contaminated with acidic materials to the extent that they cannot be discharged into rivers or streams. The device uses a low-cost material, such as crushed limestone, which is capable of reacting with the waste gas without the prior operational disadvantages of forming large quantities of acidic wash water as a result. In the device, a bed of relatively large-size particles reacts with the waste gas. The particle material may be disposed to define a porous bed through which the waste gas flows to form layers of nonvolatile salts on the exterior surfaces of the material. Crushed limestone can be used to react with oxides of sulfur and nitrogen to form salts. The material is constantly recycled; during recycling, it may be subjected to washing to remove films of salts. The constant movement of the particles of the material relative to one another tends to remove the films of salts by abrasive action. Thus, the particles which have been washed and abrasively cleaned have fresh surfaces exposed to the reactive waste gases, and optimum removal of the reactive components from the waste gas is achieved. (Author abstract modified)

36843 **APTIC NO. 59450**

Ross, Richard D.

THE CONTROL OF NITROGEN OXIDES. *Preprint, 14p., 1973. 13 refs. (Presented at the Pollution Engineering and Equipment Exposition and Conference, 3rd Annual, New York, May 1973.)*

Control methods for nitrogen oxide emissions are reviewed; and estimated costs and percentages of NOx reduction are listed for such control methods as low excess air, two-stage combustion, low excess air plus two-stage combustion, flue gas recirculation, low excess ari plus flue gas recirculation, and water injection. Two-stage combustion, catalytic reduction, or flue gas recirculation are preferred for high concentrations of NOx, as found in nitric acid or nitrating operations. Two-stage combustion requires less auxiliary fuel than flue gas recirculation, and the advantage of this system is that initial reaction is carried out at substoichiometric conditions with subsequent recovery of heat before oxygen is added to complete the reaction. Flue gas recirculation requires additional fuel to heat the recirculated flue gas. The best solution for reducing NOx in normal fuel combustion is stoichiometric combustion of the fuel with air in a device which will provide for some internal recirculation of the flue gas; current burner designs have this feature. Water injection has been utilized on an experimental basis, but it has an undesirable effect for steam or power generation because it reduces the thermal efficiency of the system. Catalysts are limited to a maximum temperature of 1500 F in most cases and require excess fuel present to keep nitrogen fixation to an absolute minimum.

36844 **APTIC NO. 60034**

Ross, Sigmund L. and Oscar Shuffman

METHOD AND APPARATUS FOR PURIFYING COMBUSTION GASES. *(Assignee not given.) U. S. Pat. 3,748,830. 17p., July 31, 1973. 2 refs. (Appl. May 19, 1972, 26 claims).*

An economical device for the removal of solid and gaseous pollutants from waste combustion gases, particularly motor vehicles with internal combustion engines, has been developed based on the scrubbing action of ice. The exhaust gases are passed over a body of ice having an extended surface such that the gases flow through an elongated zone of travel in turbulent contact with the ice. The moist sludge containing the pollutants is sloughed off of the ice surface and is collected, thereby separating the pollutants from residual combustion gases. Unburned carbon contained in the collected sludge is produced in a form having utility as a source of activated carbon and carbon black. Pollutants effectively removed include: gases such as sulfur dioxide, oxides of nitrogen, and carbon monoxide; lead salt residues from tetraethyl lead; and solid particles including unburned hydrocarbons.

36845 **APTIC NO. 59710**

Rossoff, J., R. C. Rossi, and J. Meltzer

STUDY OF DISPOSAL AND UTILIZATION OF BY-PRODUCTS FROM THROWAWAY DESULFURIZATION PROCESSES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 775-798. 21 refs. (May 14-17.)*

An ongoing Aerospace Corporation study for the Environmental Protection Agency concerning the ecologically sound disposal of sludges produced by the limestone scrubbing of coal-fired utility boiler flue gases is summarized; related utility disposal problems concerning lime-coal and limestone-oil sludges as well as the use of sludge in commercial products are also briefly outlined. A review of critical factors which affect disposal requirements and techniques is presented and includes items such as the chemical characteristics of process materials and sludges, sludge physical properties, water quality criteria, trace element constituents, and liquor recirculation. Disposal methods described include ponding and landfill type operations. The impact of input parameters on disposal methods is also briefly covered. (Author abstract modified)

36846 **APTIC NO. 59249**

Rovesti, William C. and Ronald H. Wolk

DEMETALLIZATION OF HEAVY RESIDUAL OILS. (FINAL REPORT). *Hydrocarbon Research, Inc., Trenton, N. J., Environmental Protection Agency Contract 68-02-0293, Program Element 1AB013, ROAP 21ADD-50, EPA-650/2-73-041, 151p., Dec. 1973.*

An improved demetallization catalyst was developed so that residual oil with high-sulfur and high-metal content could be desulfurized economically. Twenty-eight catalysts were prepared, representing a number of combinations of supports and promoters. Impregnating 20 by 50 mesh granulated activated bauxite with promoters provided the necessary catalytic activity and resistance to poisoning. The residua that were demetallized were Tia Juana, Bachaquero, and Gach Saran vacuum residua. Indications are that these residua can be economically desulfurized to 0.5 weight percent sulfur fuel oil. Economic analysis indicated that the fuel oil could be produced for $1.19, $1.46, and $1.64 per barrel for the Gach Saran, Tia Juana, and Bachaquero residua, respectively, in a U. S. Gulf Coast facility with a capacity of 20,000 barrels per day. These costs include hydrogen, catalyst, operating expenses, and capital charges of 25% of investment. (Author abstract modified)

36847 **APTIC NO. 59669**

Sakamoto, Kiyoshi and Teruo Watabe

VENTURI SCRUBBER WITH FLOAT. *(Furoto tsuki bentyuri sukuraba). Text in Japanese. (Sumitomo Shipbuilding and Machinery Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 48-15908. 3p., May 7, 1973. 2 refs. (Appl. April 10, 1969).*

This venturi scrubber features use of a float designed to adjust sectional area of the throat section according to flow quantity of the gas, so that high efficiency in removing dust and other impurities from the gas may be maintained at all times. Any mechanical system so far introduced for the purpose of mechanically adjusting the sectional area of the throat of a venturi tube scrubber is often subject to operational troubles due to accumulation of dust on the mechanism. The venturi scrubber introduced here has no such problem. The upper half of this scrubber is a U-shaped tubular structure with the left upright tube serving as the intake tube and the right upright tube as the discharge tube. The bottom of the middle section of the U-shaped structure is curved downward toward the mid point to form the upper side of the throat section. The lower half is a conical liquid storage tank. The float put in the liquid storage tank is symmetrical with the bottom of the U-shaped upper half, thus forming a venturi tube. The bottom of the float is conical. A spray nozzle is provided at the midpoint of the upper side of the throat section. When the throat section should be narrowed due to lower flow quantity of the gas, the liquid in the storage tank is increased to move up the float.

36848 **APTIC NO. 59697**

Sakanishi, Jun and Robert H. Quig

ONE YEAR S PERFORMANCE AND OPERABILITY OF THE CHEMICO/MITSUI CARBIDE SLUDGE (LIME) ADDITIVE SO2 SCRUBBING SYSTEM AT OHMUTA NO. 1 (156 MW-COAL FIRED). *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 419-450. (May 14- 17.)*

A 1-year s performance and operability assessment was performed for the Chemico/Mitsui carbide sludge (lime) additive sulfur dioxide scrubbing system at Ohmuta, a 156 MW coal fired plant. An excellent record of continuous operation for 202 days was established, and only minor difficulties occurred. Sulfur dioxide and dust removal efficiency were more than 90%. Inspection of internal parts revealed no major defects, and build-up of scale was not observed during pilot operations carried out at the lower side of the pH range of preferable values. No accumulation of sulfuric acid was observed in the ash pond used for settlement of waste slurry from the throwaway system. Minor troubles included accumulation of carbon particles in the slurry tank, easily removed muddy scale in the recycle water pipeline, slight damage at an expansion joint in one of the ducts, and the loss of scrubbing liquor due to loose fitting of chemical tubes which were subsequently replaced with rubber ones.

36849 **APTIC NO. 59668**

Samejima, Yasushi and Yasushi Matsuoka

REMOVAL METHOD OF MERCURY VAPORS IN GAS. *(Kitaichu no suigin joki no jokyo hoho). Text in Japanese. (Kanegafuchi Chemical Industry Co., Ltd., Osaka (Japan)) Japan. Pat. Sho 48-38080. 2p., Nov. 15, 1973. (Appl. April 7, 1970, 1 claim).*

This procedure offers a simplified, economical, and effective method for removal and recovery of mercury vapors in a gas. The method features use of an alkaline salty water containing chlorine for scrubbing a gas containing Hg. The closer the salt concentration of the salty water is to the saturation point, the more compact the device can be made. An alkaline salty water (concentration of common salt content, 300 g/l; pH 10.5; concentration of effective chlorine, 0.5%) was circulated at the flow speed of 1 l/min in a packed tower with an inside diameter of 105 mm and 700 mm in height. Hydrogen gas containing Hg vapors produced from a Hg process salt electrolytic tank was fed into the tower at the specified flow speed for counter-flow contact with the scrubbing liquid. The hydrogen gas so treated gave an Hg content of 0 mg/cu m at the exit of the tower.

36850 **APTIC NO. 59967**

Sato, Y.

CATALYTIC EXHAUST GAS CLEANING FACILITIES. *(Shokubai hoshiki joka sochi). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(11):1280-1283, Nov. 1973.*

A Tokyo Roki GC-25 type catalytic converter is described. This catalytic converter is applicable to a 1400-2000 cc automobile. It employs 1.5 l of platinum-alumina catalyst and weighs 7.5 kg. The converter consists of ejector, a catalytic reactor, a silencer, and a signalling device. The catalytic reactor is made of stainless steel and can sustain a maximum temperature of 900 C. The catalyst was prepared by incorporating 0.2 wt% Pt onto Al2O3 pellets. The four-mode test by 2000 cc automobiles showed an excellent durability of the converter, giving average reduction efficiencies of 65% for carbon monoxide and 40% for hydrocarbons after 2000 km running. High-load continuous driving tests also yielded good results. Automobile performance was slightly lowered by installment of the converter, delaying acceleration by 0.6-2 sec, losing about 10-12% of power at full-load driving of 100 km/h, and increasing fuel consumption by 10%.

36851 **APTIC NO. 59579**

Sawyer, Alan B.

GAS SCRUBBER. *(Andco Inc., Buffalo, N. Y.) U. S. Pat. 3,746,322. 8p., July 17, 1973. 5 refs. (Appl. Jan. 3, 1972, 9 claims).*

An apparatus for removing particulate material from a gas stream traveling through a duct is described. The improved wet collector advantageously includes various desirable attributes of both the orifice and venturi types. Unlike similar collectors, this one maintains the same configuration in the venturi passage defining walls as the members are moved to vary the passage size. The apparatus consists of a pair of members each provided with a corresponding plurality of passages and arranged to cooperatively define a corresponding plurality of venturi passages extending generally parallel to the direction of flow of the gas stream and spaced around the axis of the duct. The members are relatively movable for varying the size of the venturi throats and for completely closing the passages when desired. Opposed sidewalls shaped to cooperatively define each venturi passage are carried by corresponding one of the movable members whereby the configuration of the venturi passages is maintained throughout the entire range of adjustment. Liquid is supplied to the upstream member and the venturi inlets defined are of a configuration effecting a substantially uniform distribution of the liquid to the passages. This scrubber uses variable pressure to accommodate a range of particle sizes and gas flow conditions.

36852 **APTIC NO. 59706**

Scheider, Raymond T.

APPLICATION OF THE WELLMAN-LORD SO2 RECOVERY PROCESS TO STACK GAS DESULFURIZATION. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY- 30, EPA-650/2-73-038, p. 641-655. (May 14-17.)*

Process features and industrial applications are reviewed for the Wellman-Lord sulfur dioxide recovery process which is based on a sodium sulfite/bisulfite cycle. The applications include seven sulfuric acid plants, two oil-fired boilers, and five claus units. The SO2 absorber is a simple two or three-stage contacting device and can be physically separated by a large distance from the regeneration system. Hence, it is practical to treat gases from more than one plant by installing separate absorbers for each source of SO2, with all the absorbers being supplied by a common regeneration system. The final product SO2 can be delivered at whatever quality is required for further processing and is suitable for conversion to high grade sulfuric acid, elemental sulfur, or liquid SO2. Plant operations have demonstrated the process s ability to maintain emission levels at consistently less than 200 ppmv. Current applications and demonstration projects are examined and a table of capital and operating costs is given for 500 MW and 1000 MW power plants.

36853 **APTIC NO. 59993**

Schmidt-Holthausen, H. J. and B. Wolf

THE MECHANICAL-CHEMICAL AND BIOLOGICAL PURIFICATION OF REFINERY WASTE WATER WITH SPECIAL REGARD TO SLUDGE TREATMENT. *(Die mechanisch-chemische und biologische Reinigung von Raffinerieabwaessern unter besonderer Beruecksichtigung der Schlammbehandlung). Text in German. Industrieabwaesser, 1973:12- 16, 1973.*

The recently modernized purification plant of a large refinery in West Germany is described. The oil is mechanically separated, neutralized, flocculated, and then treated with activated sludge. The sludge is concentrated and pumped to a fluidized bed furnace incinerator. Inside the fluidized bed an air surplus of lambda greater than 1.2 is maintained. Afterburning process air is injected above the fluidized bed. The temperature during afterburning rises to more than 800 C through which all odors are eliminated. To avoid dust emissions through leaky flanches the entire incinerator from the upper edge of the fluidized bed on is operated with a slight underpressure. A venturi scrubber is provided to clean the stack gases from the incinerator.

36854 **APTIC NO. 59774**

Schmied, J. and P. Buechler

EVALUATION OF MEASURES TAKEN BY PULP MILLS FOR AIR AND WATER POLLUTION PREVENTION. *(Bewertung der von Zellstoffabriken ertriffenen Massnahmen zur Kontrolle der Verunreinigung von Wasser und Luft). Text in German. Associazione Tecnica Italiana per la Cellulosa e la Carta and Food and Agricolture Organization Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 283-298. 10 refs. (May 7-11.)*

The effect of condensate return on the composition of the digesting acid, on the discharge of organic effluents, and on the harmfulness of the condensates was studied by mathematic modeling and computer simulation of an acid magnesium disulfite pulping process. The maximum possible rate of recycling of the secondary condensates from the evaporator to the digesting acid preparation was 60% at which the condensate was sufficient for the absorption of sulfur dioxide from the waste gases. The rates of discharge of methanol and furfurol to the atmosphere increased with increasing recycling rate of the secondary condensates of the evaporator. Notwithstanding, the methanol discharge to the atmosphere from the absorption system was negligible.

36855 **APTIC NO. 59700**

Schultz, J. J., T. M. Kelso, J. L. Graham, J. K. Metcalfe, and N. D. Moore

THE TVA WIDOWS CREEK LIMESTONE SCRUBBING FACILITY. PART II. PILOT-PLANT AND PROTOTYPE OPERATING EXPERIENCE. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 495-538. (May 14-17.)*

A Tennessee Valley Authority limestone-wet scrubbing pilot plant test program was conducted to provide information for the design and operation of a demonstration-scale 550 MW scrubber system now under construction at the TVA s Widows Creek power station. The following conclusions were drawn from the study: limestone wet scrubbing provides an effective method for removing sulfur dioxide from boiler flue gas; an

SO2 removal efficiency of 70% can be expected using a multigrid type of scrubber with a scrubbing liquor recirculation rate of 50-60 gallons per 1000 cu ft of gas and a calcium to SO2 ratio of 1.5; efficiency can be increased to about 90% if a two-stage mobile-bed scrubber is used; techniques for adequate long-term disposal of the spent solids from the scrubbing slurry (including fly ash) have not been developed; and the long-term operating reliability of the limestone-wet scrubbing system will be largely determined by proper design and selection of suitable construction materials to cope with the erosive and plugging characteristics inherent in slurry scrubbing. (Author abstract modified)

36856 **APTIC NO. 60287**

Schwartz, Charles W.

ENGINE EXHAUST GAS PURIFICATION SYSTEM. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,761,229. 4p., Sept. 25, 1973. 5 refs. (Appl. July 19, 1971, 9 claims).*

A system for the purification of internal combustion engine exhausts is described. It includes a catalytic converter and a means for supplying fuel to the catalytic converter when the engine is inoperative. The system can include a fuel container, a fuel pump, a check valve, an accumulator, and a pressure regulator. Fuel from the pressure regulator may be supplied to a gas-permeable chamber positioned close to the catalyst in the converter. Fuel supplied to the catalytic converter from the pressure regulator exothermically reacts with air. The reaction is assisted by the catalyst in the converter, and the reaction heat maintains the catalyst at an effective temperature. This system allows the catalytic converter to work immediately upon the startup of a cold engine to substantially reduce undesirable exhaust gas constituents. (Author abstract modified)

36857 **APTIC NO. 59218**

Schweikert, John F. and John H. Johnson

A TURBOCHARGED SPARK IGNITION ENGINE WITH LOW EXHAUST EMISSIONS AND IMPROVED FUEL ECONOMY. *Preprint, Society of Automotive Engineers, Inc., New York and Motor Equipment Manufacturers Assoc., 16p., 1973. 11 refs. (Presented at the Society of Automotive Engineers, Combined Commercial Vehicle Engineering and Operations and Powerplant Meetings, Chicago, Ill., June 18-22, 1973, Paper 730633.)*

A turbocharged multicylinder spark ignition engine with thermal reactors and exhaust gas recirculation (EGR) was tested at steady-state, part-load conditions for four engine speeds. Turbocharging, in addition to increasing the engines power output, maintained exhaust emission levels while improving fuel economy. When comparing a turbocharged engine to a larger displacement naturally aspirated engine of equal power output, the emissions were relatively unchaged both with and without EGR. However, turbocharging provided an average of 20% improvement in fuel economy both with and without EGR. Turbocharging without EGR increased the hydrocarbon and carbon monoxide emissions and decreased oxides of nitrogen emissions compared to nonturbocharged engines. With the addition of EGR, turbocharging increased all three emissions. When comparing turbocharged and nonturbocharged engines of equal displacement on the heavy-duty 13-mode dynamometer cycle, turbocharging reduced CO emissions and increased HC and NOx emissions both with and without EGR. (Author abstract modified)

36858 **APTIC NO. 59758**

Searle, Charles

FEASIBILITY OF ELECTRIC TAXIS AND BUSES IN NEW YORK CITY. *New York State, Public Service Commission, OER Rept. 17, 54p., June 1973. 16 refs.*

The feasibility of converting New York City taxis and buses to electric power by 1975 was investigated. It is estimated that electric taxis and buses would require 2440 million Kwh's of energy annually, or 7.4% of the energy supplied by this utility to its customers in 1972. Assuming that electric current for electric vehicles is generated on present baseload units during off peak hours and gasoline mileage is unchanged by pollution controls, electric taxis and buses would require 14% more energy than their gasoline and diesel equivalents. If regenerative gas turbines are added to the Consolidated Edison system, and if pollution controls reduce gasoline mileage, electric taxis and buses would consume approximately 8% less energy than gasoline and diesel powered vehicles. The actual amount of contamination discharged into the airways would decline. A greater improvement in pollution at ground level would result because exhausts from tail stacks at power plants would disperse and fall to the ground in less concentrated quantities. (Author summary modified)

36859 **APTIC NO. 59265**

Seizinger, D. E. and B. Dimitriades

OXYGENATES IN AUTOMOTIVE EXHAUSTS. EFFECT OF AN OXIDATION CATALYST. *Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, Report of Investigations 7837, 23p., 1973. 7 refs.*

Analytical methods for oxygenates in exhaust gases were studied, and emissions of these compounds from automotive engines were measured with and without an oxidation catalyst in the exhaust system. Hydrocarbons, simple mixtures of hydrocarbons, and a single gasoline were used as fuels. With the more complex gasoline, successful analysis was possible only with exhaust from the catalytic system which preferentially converted and thus removed interfering hydrocarbon species. However, an estimate of the oxygenate yield from gasoline used in a noncatalytic system can be synthesized from data obtained with simple fuels. Such synthesized data were used for comparison of noncatalytic with catalytic systems. Compared with those of previous studies, results of this work indicate that the action of the catalyst introduced no new oxygenates and reduced both the carbonyl and the total oxygenates. The compositional character and class distribution of oxygenates in exhaust from catalytic systems may differ significantly from the compositon and distribution for oxygenates not subjected to catalytic conversion. The findings also support previous estimates that noncarbonyls may constitute a significant fraction of exhaust oxygenates and may warrant attention in procedures for measurement of the oxygenates. (Author abstract modified)

36860 **APTIC NO. 59796**

Seki, T., N. Ono, and H. Kamei

TEST RESULTS ON NOX INVESTIGATION OF BOILERS. *(Boira ni okeru NOx chosa shiken kekka ni tsuite). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(11):21-25, Nov. 1973.*

Test results from the investigation of nitrogen oxides emission from boilers at the Tsurusaki petrochemical complex are reported. Experiments were made with the 260 tons/hr boiler (A), and with the 380 tons/hr boiler (B), both on full load, to investigate the effects of oxygen concentration of fuel gas, furnace temperature, and nitrogen contents of fuel on NOx emission. Grade C heavy oil was used for (A), and C heavy oil plus waste gas were used for (B). On B, a by-pass line was arranged to examine the temperature effect of preheated air. The effect of a two-stage burner was tested by cutting the upstage burner. In the case of A, when operating conditions were changed so that the oxygen concentration at the exit was from 1.0% to 0.45%, NOx decreased from 500 ppm to 470 ppm, and was further lowered when the oxygen was 0.3%. In the case of B, oxygen concentration from 0.85% to 0.4% gave NOx of 300 ppm to 265 ppm. Furnace temperature may be lowered by low temperature combustion, which may be obtained by preheating the air through a by-path, by cutting the up-stage burner, or by using low oxygen combustion. The most effective result was obtained by two-stage combustion, which gave a 40% decrease of NOx for both boilers. Mixing waste gases also reduced the NOx.

36861 **APTIC NO. 60165**

Selway, Jack J.

GAS SCRUBBER. *(Andco Inc., Buffalo, N. Y.) U. S. Pat. 3,761,064. 10p., Sept. 25, 1973. 5 refs. (Appl. Dec. 30, 1970, 15 claims).*

An apparatus for removing particulate material from a gas stream traveling through a duct comprising a pair of members, each provided with a corresponding plurality of passages and arranged to cooperatively define a corresponding plurality of venturi passages extending generally parallel to the direction of flow of the gas stream and spaced around the axis of the duct is described. The members are relatively movable for varying the size of the venturi throats and for completely closing the passages when desired. Liquid is supplied to the upstream member and the venturi inlets defined thereby are of a configuration effecting a substantially uniform distribution of the liquid to the passages. This apparatus combines various desirable features of orifice and venturi scrubbers. It equals, if not exceeds the capabilities of a venturi scrubber in an apparatus characterized by the relative simplicity and low cost of an orifice scrubber. The pressure drop can be varied to provide effective agglomeration for various particle sizes, and the pressure drop can be maintained despite varying flow conditions. The collector is relatively small, simple in construction and operation, and relatively inexpensive. It can effect a water seal when needed and in a relatively simple manner. (Author abstract modified)

36862 **APTIC NO. 59820**

Sen kevich, E. V.

REMOVAL OF SOLVENT VAPORS FROM WASTE GASES IN HEATING UNITS OF DRYING FACILITIES. *(Ochistka gazovykh vybrosov ot parov rastvoritelya v tekhnologicheskikh skhemakh obogreva syshil nykh ustanovok). Text in Russian. Avtomob. Prom., no. 12:31-33, 1973. 7 refs.*

Various designs for the thermal and catalytic afterburning of drying equipment-generated waste gases containing solvent vapors in convective, radiative, and radiative-convective drying equipment are proposed. The waste gases containing solvent vapors are admitted to the natural gas burner as secondary air, whereby the solvent vapors are burned within the technological process. The efficiency of such thermal afterburning does not exceed 60-70%. More efficient destruction of the solvent vapors is possible by catalytic afterburning, using hot flue gases to preheat the waste gases to be purified to 250-350 C. Part of the purified waste gas is recycled within the drying process, while the rest is discharged into the atmosphere.

36863 **APTIC NO. 60104**

Severs, Richard K.

APPARATUS FOR SEPARATING PARTICULATE MATTER FROM A GASEOUS SUSPENSION. *(Scientific and Educational Services, Inc., Houston, Tex.) U. S. Pat. 3,742,680. 7p., July 3, 1973. 12 refs. (Appl. April 19, 1971, 9 claims).*

An apparatus for the electrostatic separation of particulate matter from a gaseous stream has been designed to concentrate the particulates at a point outside the major flow path of the suspending gas thereby avoiding prior art requirements for high power input to compensate for recharging of neutralized particles. The apparatus is suitable for high velocity gas streams, has a low power requirement, and is compact enough to be installed in an automobile exhaust system. The device includes an electrically insulated flue through which the suspension is passed, a perforate wall in the flue, and a collecting electrode located outside the flue. The arrangement provides maximum field intensity at the point of perforation and accelerates the particulate matter through the perforation to the collecting electrode where it is discharged.

36864 **APTIC NO. 59437**

Shah, Indravadan S.

MULTI-STAGE REMOVAL OF ENTRAINED SOLIDS AND SULFUR DIOXIDE FROM GAS STREAMS. *(Chemical Construction Corp., New York) U. S. Pat. 3,764,654. 6p., Oct. 9, 1973. 2 refs. (Appl. Oct. 28, 1971, 8 claims).*

A two-stage process for the removal of entrained solids and sulfur dioxide from gas streams via venturi scrubbing has been developed to achieve more efficient and complete removal of the above components with a reduction in overall pressure drop of the gas stream during scrubbing; the aqueous alkaline or slightly acidic scrubbing solution is also employed in a more efficient manner. A low liquid to gas flow ratio is provided in the first venturi stage along with high gas velocity in the venturi passage. This combination of conditions results in high removal from the gas stream of entrained solids such as fly ash. The resulting gas-liquid mixture is then passed through the second venturi passage at relatively low velocity and a high liquid to gas flow ratio. This combination of conditions results in high removal of SO2 from the gas stream. The resulting scrubbed gas stream discharged from the second venturi passage is separated from the liquid or slurry phase which contains the entrained solid particles and SO2, and the scrubbed gas stream is discharged to the atmosphere. (Author summary modified)

36865 **APTIC NO. 60166**

Shaw, Harry D. and George E. Strausbaugh

GAS CLEANING SYSTEM. *(Assignee not given.) U. S. Pat. 3,753,337. 5p., Aug. 21, 1973. 11 refs. (Appl. June 18, 1971, 1 claim).*

A system for cleaning gas and particularly for removing fine solid particles is described. It includes a cyclone separator and a unit separator downstream interconnected by a duct containing sources of oppositely directed liquid curtains or sprays through which the gas stream passes. A wire maze filter is positioned in the duct downstream of the curtains in a position to be washed by the second curtain. A second separator receives the issue from the duct and provides a broad area reentrant gas path to an exit and a surface upon which fluid and removed solids accumulate and flow under the influence of gravity to a sump and/or exit. Previous similar systems have not been efficient enough because of inadequate wetting of particles and the failure to precipitate the particles from the gas stream whether they have been wetted or not. The present system solves this problem and is capable of removing large and small particles and salvaging them if they are re-useable material. Light particles are removed with greater efficiency than with previous systems as a result of the mixing of particles and water within the water spray and filter units. The general absence of moving parts makes the system generally maintenance free. (Author abstract modified)

36866 **APTIC NO. 59795**

Shinohara, Y.

WHOLE HOUSE DUST COLLECTING SYSTEM FOR ELECTRIC FURNACE STEEL MAKING. *(Denkiro seiko yo tateya shujin sochi ni tsuite). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(11):35-44, Nov. 1973. 3 refs.*

The whole house dust collecting system prevents dust pollution during charging and discharging operations of electric furnaces. Economical design depends on judicious consideration of the volume of air to be treated. Dustless heat sources should be excluded from the system. The layout of the house should prevent the effects of wind and minimize the area that must be airtight. Formulas are reported for calculation of rising air with 10% accuracy. Generally, the air volume treated by this system is four to five times greater than with a partial dust collecting system. On the other hand, the temperature of the air is only 40 to 50 C, allowing the elimination of a cooling system and a decrease in the size of the filter. A canopy hood system can be operated with natural ventilation or with a partial dust collecting system. A closed house with a reservoir system decreases the air volume to 1/3 when there is no heat source other than the electric furnace. A monitor-controlled reservoir system has also been developed which is regulated by the monitored rising air. A canopy system may be combined with a closed system. Recently, electrostatic precipitation has been made available with the whole house system.

36867 **APTIC NO. 59709**

Slack, A. V. and J. M. Potts

DISPOSAL AND USE OF BYPRODUCTS FROM FLUE GAS DESULFURIZATION PROCESSES. INTRODUCTION AND OVERVIEW. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 747-773. 11 refs. (May 14-17.)*

An overview of the current status of technology concerning the disposal and use of by-products from flue gas desulfurization is presented. Waste sludge from lime-limestone scrubbing is considered in terms of sludge tonnage, sludge volume, factors affecting the degree of compaction, methods for increasing compaction, pond management, landfill disposal, and water pollution. Other topics covered include waste calcium sulfate from acid neutralization, problems and attractions of elemental sulfur as a waste material, the use of lime-limestone scrubber sludge as a soil amendment, as highway base material, and as an additive for construction materials, major problems in sulfuric acid marketing, the advantages of sulfur over acid as a by-product, and examples of processes which produce fertilizer compounds as by-products.

36868 **APTIC NO. 59425**

Smith, Harold W. and Donald G. Saurenman

POLLUTING FUME ABATEMENT APPARATUS. *(Consan Pacific Inc., Whittier, Calif.) U. S. Pat. 3,768,258. 4p., Oct. 30, 1973. 2 refs. (Appl. May 13, 1971, 8 claims).*

An internal combustion engine fume abatement apparatus operating on the electrostatic principle has been specifically designed to include the reduction of particulate pollution which has been given insufficient attention in previous devices for exhaust abatement. The device includes an exhaust duct for passing a stream of engine combustion products having electrically chargeable components and an ion generator to effect a flow of ions into the exhaust stream. The ion density and polarity are such as to change the electrical charge of the contents for subsequent precipitation on a surface. The generator may comprise multiple pointed tips proximate the duct which may either be exposed to the exhaust stream or be protected from direct exposure by an insulative shroud which defines an outlet for the ions to pass from the tips to the stream path.

36869 **APTIC NO. 59604**

Smith, S. E., J. Dyment, R. G. Dorman, and J. E. Firman

SOLID--GAS FILTRATION: ASSESSMENT. *In: I. Chem. E. Filtration Working Party Rept., 1973. p. 31-36, Nov. 1973.*

The factors affecting efficiency of a filter in contrast to the efficiency of using a standard test method, and the sampling of particulate solids in still air or moving gas streams are discussed. A general classification of air filters is described which would be more informative than a mere statement of efficiency. High efficiency fibrous filters have 99.95% or better efficiency. These group I filters collect particles in the submicron particle size range. Their efficiency is affected by particle size, velocity, concentration, time, temperature, electrostatic precipitators, and bag filters. Filter performance can be tested by sodium chloride, methylene blue, dioctyl phthalate, or other tests. Group II filters collect 1.0 to 10 micron particles and include fiber or pleated fabric panel filters, two-stage electrostatic precipitators, fibrous curtain filters, and viscous filters. Performance tests for these medium efficiency devices include blackness, dust spot, methylene blue, ICI radioactive, BS 2831, and ASHRAE tests. Group III filters are coarse air cleaning devices which collect particles over 10 micron. These include inertial collectors, cyclones, impingement scrubbers, venturi scrubbers, electrostatic precipitators, combustion inlet filters, sintered filters, and bag filters. Efficiency of this group on coarse dust varies from 50% for an inertial collector to 99.9% for a high energy venturi scrubber. Test methods include gravimetric methods with various test dusts. Various sampling methods are discussed including sedimentation cells, thermal precipitators, impactors, cascade impactors, impingers, electrostatic precipitators, conifuges, filters, rod samplers, and light scattering instruments.

36870 **APTIC NO. 59383**

Soo, S. L.

PARTICLE-GAS-SURFACE INTERACTIONS IN COLLECTION DEVICES. *Int. J. Multiphase Flow, 1(1):89-101, Oct. 10, 1973. 16 refs.*

Removal of particles from a gas suspension via a surface, and subsequent regeneration of the surface, are analyzed. The deposition of the particles in the collection device is primarily due to electric field (in electrostatic precipitators) and to a combination of electric and centrifugal fields (in a cyclone separator). Proper design of particle separation devices, including surface regeneration, is related to these field forces and to other effects. (Author abstract)

36871 **APTIC NO. 59799**

St. Cyr, Lewis A. and Loren H. Young

PREVENTION OF AIR POLLUTION BY USING SOLID ADSORBENTS TO REMOVE PARTICULATES OF LESS THAN 0.5 MICRONS IN SIZE FROM FLUE GASES. *(Vulcan Materials Co., Birmingham, Ala.) U. S. Pat. 3,750,372. 8p., Aug. 7, 1973. 6 refs. (Appl. April 1, 1971, 15 claims).*

A process for the prevention of air pollution using solid adsorbents to remove particulates of less than 0.5 micron from flue gases is described. Other processes use coke or activated carbon and are not effective in the submicron size. This process uses calcium sulfate, zeolitic molecular sieves, dicalcium orthophosphate, clays, and slates, and mixtures of them. Calcium sulfate in its anhydrous and hemihydrate forms is particularly effective in removing metal halide solids, e.g., aluminum chloride, potassium chloride, sodium chloride, and aluminum fluoride of less than 0.1 micron in size from the gaseous effluent of aluminum processing operations which utilize a gaseous chlorine treatment of molten Al. The intensity or the white smoke is also either prevented or reduced in the process. (Author abstract modified)

36872 **APTIC NO. 60200**

Stalker, William

SMOKE AND AIR CLEANER ASSEMBLY. *(Assignee not given.) U. S. Pat. 3,760,567. 4p., Sept. 25, 1973. 12 refs. (Appl. Aug. 13, 1971, 1 claim).*

A fan assembly is provided with a smoke stack upon which is sprayed water so that the smoke is thoroughly washed. The water is then collected and discharged externally of the smoke stack unit for further processing. The clean smoke passing through the stack may be further processed by recirculating the smoke through a drier, thus controlling the moisture content of the resultant discharging air. The method can be used with various furnaces or industrial plants to clean stack gases of smoke, fly ash, or dust. The device is more economical than electrostatic separators or regular scrubbers. (Author abstract modified)

36873 **APTIC NO. 59596**

Stengel, Mathew P.

REDUCING NOX EMISSIONS BY ADDITIVE INJECTION. *(Combustion Engineering, Inc., Windsor, Conn.) U. S. Pat. 3,746,498. 4p., July 17, 1973. 2 refs. (Appl. Jan. 24, 1972, 6 claims).*

A method for reducing nitrogen oxides formed during combustion processes by injecting materials into a fuel-rich combustion zone is described. These additives decompose to produce reducing agents such as hydrogen and carbon monoxide which in turn react with the nitrogen oxides to produce nitrogen. The additives may comprise formates and oxalates such as sodium formate and sodium oxalate. Unlike previous two-stage combustion methods, this method meets the more stringent emission control requirements. The carbonates which are formed are also useful to reduce sulfur oxide pollution. (Author abstract modified)

36874 **APTIC NO. 59830**

Stettler, Richard J. and Albert J. Verdouw

RECIRCULATING COMBUSTOR. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,744,242. 10p., July 10, 1973. 5 refs. (Appl. Jan. 25, 1972, 5 claims).*

A recirculating gas turbine combustor has been designed to reduce nitrogen oxide output associated with high-intensity type combustors of prior art design. A combustion liner is mounted within an inner casing, the two defining between them a recirculation duct for combustion products. The inner casing is mounted within an outer casing, and these two define a dilution air duct in which the dilution air is heated while cooling the recirculating combustion products. The combustion liner wall is double and defines a combustion air duct with a nozzle at its downstream end for effecting recirculation. Tubes which conduct combustion air into the liner support the combustion liner from the forward wall of the casing, and a valve arrangement controls the ratio of combustion air to dilution air. (Author abstract modified)

36875 **APTIC NO. 60032**

Stevenson, Calvin Leo

PROCESS FOR RECLAMATION OF FLUE DUST. *(Deltech, Inc., Denver, Colo.) U. S. Pat. 3,756,804. 7p., Sept. 4, 1973. 8 refs. (Appl. Feb. 16, 1972, 10 claims).*

A method for the treatment of flue dust from iron-making furnaces to recover minor constituents which are volatile at high temperature and to reduce the iron components in the dust to a state where they can be recycled to the furnace or otherwise used is described. The method consists of preheating the flue dust to a temperature approaching 1700 F. Then the flue dust particles are passed into a reducing, essentially oxygen-free, atmosphere where the temperature is increased to as high as 2200 F. A portion of this reducing atmosphere is continuously diverted and cooled to condense the metallic volatiles, primary zinc. Thereafter, the remaining components of the dust are cooled and released, at a temperature less than 700 F, to recover the iron without reoxidation when it is exposed to the atmosphere. By recycling the flue dust, air pollution is reduced and valuable components are economically reclaimed. (Author abstract modified)

36876 **APTIC NO. 59696**

Stewart, J. F.

A REVIEW OF BABCOCK AND WILCOX AIR POLLUTION CONTROL SYSTEMS FOR UTILITY BOILERS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY- 30, EPA 650/2-73-038, p. 393-417. 5 refs. (May 14-17.)*

Demonstration control systems developed by Babcock and Wilcox for the removal of sulfur dioxide and particulates from utility boiler stack emissions are described. A limestone wet scrubbing system has been retrofitted on a 163 MW radiant cyclone-fired boiler located at the Will County Station of Commonwealth Company; expected performance corresponds to an outlet dust emission of 0.0124 grains/DSCF and a SO2 removal efficiency of 81.6%. A second demonstration limestone wet scrubbing system is being supplied for a new electric power generating station located near La Cygne, Kansas. The system consists of seven venturi-absorber scrubber modules designed to handle the entire flue gas flow of 2,370,000 AGFM at 98.75% particulate removal and 80% SO2 removal efficiency. A wet magnesia scrubbing system is being developed as a sulfur recovery process for retrofit to existing units; sulfur dioxide removal is accomplished in an absorber of the same design utilized for limestone scrubbing. A dry sorbent flue gas desulfurization process is also being developed, and a sorbent material that will absorb and desorb SO2 in the temperature range of 600-700 F appears feasible.

36877 **APTIC NO. 60195**

Suzue, Shunji and Wataru Imase

A STUDY ON DUST COLLECTING TECHNIQUES OF COAL-BURNING BOILERS. *(Sekitan boira no shujin gijutsu ni kansuru kenkyu). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:81-84, May 1973.*

The efficiency of a cyclone used to collect dust emitted from a coal-burning boiler was tested. The cyclone dust collector has only an average efficiency of 69.1% and it is not adequate to reduce emissions to reach the present emission standard of 0.4 g/N cu m. Efficiency is also highly dependent on operating variables. A heavy oil-burning boiler would control dust emissions more efficiently.

36878 **APTIC NO. 59591**

Sweeney, Maxwell Patrick

CARBURETOR APPARATUS AND METHOD. *(Energy Transmission Corp., San Bernardino, Calif.) U. S. Pat. 3,747,983. 14p., July 17, 1973. 5 refs. (Appl. Nov. 27, 1970, 30 claims).*

A novel apparatus and method for reducing pollutant emissions by improving fuel atomization and optimizing the air fuel ratio in the carburetion of internal combustion engines are described. A small stream of bleed air is mixed with the fuel after it has passed through the fuel metering restriction, but before atomization, and then passed through the atomizing orifice. The atomizing velocity is increased, causing improved atomization, better combustion of the mixture, and less pollutant emissions. By providing the bleed air from a source wherein the pressure is generally inversely related to the rate of fuel flow, a relatively large amount of bleed air is made available. This improves combustion at low speed operating conditions when hydrocarbon emissions tend to be excessive, while accommodating greater fuel flow as required during high speed operating modes when atomization is normally good. Modulation of this bleed air flow provides an effective means for adjusting the air fuel ratio output of the carburetor. (Author abstract modified)

36879 **APTIC NO. 59827**

Tanasawa, Yasushi, Tokuta Inoue, Hidetaka Nohira, and Mitsumasa Yamada

AFTER-BURNER FOR AN INTERNAL COMBUSTION ENGINE. *(Toyota Jidosha Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,744,250. 4p., July 10, 1973. 6 refs. (Appl. Feb. 17, 1971, 1 claim).*

An internal combustion engine exhaust gas afterburner for reducing the amount of unburned exhaust components has been designed to achieve a more stable and powerful flame than prior art devices by the use of vortex combustion. The apparatus consists of a reactor, a flame inlet port for maintaining the vortex combustion chamber and reactor in communication with each other, and an exhaust gas inlet pipe connected to the reactor for introducing exhaust gas from the engine. (Author abstract modified)

36880 **APTIC NO. 59711**

Taylor, W. C.

EXPERIENCE IN THE DISPOSAL AND UTILIZATION OF SLUDGE FROM LIME- LIMESTONE SCRUBBING PROCESSES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 799-833. (May 14-17.)*

A five-phase program was undertaken by Combustion Engineering Incorporated to develop ecologically safe and economically sound disposal and/or utilizations methods for sludge from lime-limestone scrubbing processes. The phases consisted of: an environmental survey of 22 electric utilities covering the continental United States; characterization of air pollution control system sludge, including thermal analysis; investigation of direct disposal methods involving ponding studies and landfill studies; beneficiation methods for sludge utilization; and large scale demonstration studies concerning the use of sludge as a highway construction material. Beneficiation methods and studies were limited to those that are necessary to dewater the slurry from 10% solids to the 70% required for landfill operation.

36881 **APTIC NO. 60135**

Teverovskiy, B. Z., V. M. Zhuravlev, and N. K. Shumkova

AERODYNAMIC ASSAY OF A GRANULAR FILTER DESIGNED FOR THE HIGH-TEMPERATURE PURIFICATION OF INDUSTRIAL GASES. *(Aerodinamicheskiye issledovaniya zernistogo fil tra dlya vysokotemperaturnoy ochistki promyshlennykh gazov). Text in Russian. Energetik (Moscow), no. 12:114-118, 1973.*

The gas flow velocity distribution in front and behind an upright model dust filter, composed of shelves placed on over one another in louver-like arrangement with granular filter material on them, was studied by means of a hot-wire anemometer. The shelves carrying the granular filter material were slanted inward at an angle of 45 deg. Uneven distributions of the gas flow velocities in front of the vertical louver filter, with the highest flow velocities in its lower part, were determined. The distribution of the flow velocities became greater, even when the gas flow rate was reduced. The velocity distribution in front of the filter was also greater when the purified gas was exhausted on top than when it was removed in the center of the filter. The gas velocity distribution behind the louver filter was not influenced by the filter design, the rate of filtration, or the mode of the gas removal. The flow mean velocity in front of the filter was many times higher than the relative rate of filtration, and it was about equal with the mean velocity measured behind the filter.

36882 **APTIC NO. 60018**

Tohata, H.

THEORY AND PRACTICE FOR EXHAUST GAS DENITROGENATION. *(Haien datssho no riron to jissai). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(11):12-16, Nov. 1973. 3 refs.*

Various techniques for removal of nitrogen oxides from exhaust gas are reviewed. A dry process catalytic reduction method has been made commercially available for auto exhaust gas, but in order for this process to be applicable to stationary sources problems of catalyst selectivity, cost, high fuel consumption, and the need for complete prior dust removal must be solved. Ammonia, carbon dioxide, hydrogen, or methane is used as the reducing agent, and platinum, rhenium, or copper oxide is used as the catalytic component. An abundant catalyst must be used to accelerate the reduction velocity of NO_x to nitrogen, because the reaction is slower than that between the reducing agent and residual oxygen. The use of hydrogen sulfide as a reducing agent has also been studied. In a wet process, alkali solution is commonly used as an absorbent. The efficiency decreases as the nitric oxide/ nitrogen dioxide ratio increases. The NO must be oxidized to NO_2 before it can be effectively absorbed, but the oxidation of NO is slow. In order to accelerate the oxidation, active carbon or oxidizing agents such as chlorite have been used.

36883 **APTIC NO. 59581**

Tongue, Thomas O.

VENTING DEVICE. *(Grace (W. R.) and Co.) U. S. Pat. 3,744,976. 3p., July 10, 1973. 7 refs. (Appl. Nov. 23, 1970, 3 claims).*

An effective method and apparatus for removing particulate matter and noxious chlorine fumes from the vent stacks of aluminum chloride condenser chambers are described. The purifying device in the preferred mode consists of a secondary condenser chamber in combination with a container having at least one layer of glass wool and at least one layer of a reactive or adsorbent material. The device effectively vents aluminum chloride primary condenser chambers to the atmosphere without causing any deleterious backpressure or suction forces in the condenser chambers. Any noxious Cl_2 or other gases, and any particulate Al or other compounds are removed by this device precluding any venting into the atmosphere. (Author summary modified)

36884 **APTIC NO. 60097**

Ukeguchi, Nobuhiro

PREDICTION TECHNIQUES OF AIR POLLUTION. *(Taiki osen no yosoku gijutsu). Text in Japanese. Preprint, Japan Society of Instrument and Control Engineers, Tokyo, p. 23-27, 1973. (Presented at the Japan Society of Instrument and Control Engineers Symposium on Environmental System, Kitakyushu, Japan, Nov. 26, 1973.)*

Industrial production in Japan is increasing at the rate of 12% per year and is expected to double the present level in 6 years, due to the rapid expansion of the heavy chemical industry situated in large physical complexes. Petroleum supplies 80% of the total energy in Japan. Industrial emissions have combined with topographic interactions meteorological conditions to create a serious air pollution problem. Control technology, monitoring programs, and prediction techniques are discussed in relation to the total control program for a point source. Statistical analyses of past and present pollution patterns and micrometeorology, performed with actual air quality measurements, wind tunnel experiments, and computer analyses can predict possible air pollution concentrations under all meteorological conditions. An appropriate air quality control program may be devised using this data, and continuous monitoring will suggest required modifications over time.

36885 **APTIC NO. 59440**

Urban, Peter

CONTINUOUS PROCESS FOR SCRUBBING SO_2 FROM A GAS STREAM WITH H_2 REGENERATION. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,764,653. 11p., Oct. 9, 1973. 4 refs. (Appl. June 24, 1971, 24 claims).*

A flue gas scrubbing system for the removal of sulfur dioxide has been developed which is capable of continuous operation with a closed-loop absorbent circuit, which can selectively produce an easily-removed substance as the principal product of the regeneration section, and which can minimize the amount of undesired sulfate by-products formed as compared to similar procedures. The process consists of the following steps: scrubbing the input gas stream with an aqueous absorbent stream containing an alkaline reagent; treating the resulting rich absorbent stream with a reducing agent at conditions selected to convert the sulfite compound contained therein to the corresponding thiosulfate compound; catalytically reacting the resulting thiosulfate compound with hydrogen at reduction conditions selected to produce the corresponding sulfide compound; stripping hydrogen sulfide from the resulting solution to form a regenerated aqueous absorbent stream; and passing at least a portion of the regenerated absorbent stream to the scrubbing step. (Author abstract modified)

36886 **APTIC NO. 60288**

Van Dyken, Harold B. II and Denard A. Brandt

METHOD AND APPARATUS FOR DISLODGING ACCUMULATED DUST FROM DUST COLLECTING ELEMENTS. *(Kennecott Copper Corp., New York) U. S. Pat. 3,759,014. 6p., Sept. 18, 1973. 8 refs. (Appl. May 12, 1971, 13 claims).*

An electrostatic precipitator for industrial dusts is described. It has dust-collecting elements mounted for transverse vibration and vibrating means that insure maximum effectiveness in dislodging dust accumulations, without the destructive longitudinal rapping techniques customarily employed by the art. The dust-collecting elements are hinge mounted, either individually on respective axes or collectively on an axis in common. The waves travel along the lengths of the elements, so no force moments are transmitted to the supporting structure. Vibratory motion is applied by any suitable means, such as vibrators of various conventional types, through a moment arm located at or adjacent to the hinge mounting. The vibration is controlled to match the natural frequency of the dust-collecting elements; such elements are selected on the basis of possessing easily induced natural frequencies. The entire structure is resiliently mounted with respect to the enclosing housing and its supporting framework. (Author abstract modified)

36887 **APTIC NO. 60201**

Van Raden, Earl M.

FUME INCINERATOR. *(Mahon Industrial Corp., Saginaw, Mich.) U. S. Pat. 3,754,869. 4p., Aug. 28, 1973. 2 refs. (Appl. Aug. 19, 1971, 4 claims).*

A fume incinerator for afterburning fumes containing air pollution includes a casing having a burner disposed in a combustion chamber. The casing includes an outer compartment which is sealed from the combustion chamber and provides a dead air space between the combustion chamber and the outer walls of the casing. A blower receiving fumes from an industrial process or apparatus directs the fumes into the combustion chamber. A conduit connected to the dead air chamber is connected with the suction conduit of the blower so that any fumes which may leak into the dead air space or chamber are immediately removed and returned into the combustion chamber, thus preventing leakage of the fumes through the outer walls of the casing and into the atmosphere. The fume incinerator is an improvement over prior incinerators since it prevents the inadvertent escape of fumes prior to their incineration. (Author abstract modified)

36888 **APTIC NO. 59764**

Vatavuk, William M.

A TECHNIQUE FOR CALCULATING OVERALL EFFICIENCIES OF PARTICULATE CONTROL DEVICES. *U. S. Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, EPA-450/2-73-002, 22p., Aug. 1973. 8 refs.*

NTIS: PB 224205/AS

A generalized mathematical technique was developed to calculate the overall collection efficiency of particulate control devices. Equipment operating parameters and the size distribution of the particles in the inlet gas stream are used in the calculation. The technique was successfully applied to efficiency calculations for settling chambers, cyclones, venturi scrubbers, and electrostatic precipitators. Extension of this mathematical method is made to encompass control devices operated in series. Specific samples are also included to illustrate the technique when it is applied to single and multiple devices. (Author abstract modified)

36889 **APTIC NO. 60069**

Versluis, Roeland, Jacob Schinkelshoek, and Pieter J. Schuurman

GAS TREATING APPARATUS. *(Shell Oil Co., New York) U. S. Pat. 3,747,308. 6p., July 24, 1973. 2 refs. (Appl. Feb. 1, 1972, 7 claims).*

An apparatus for contacting stack gases with a solid material suitable for removing undesirable compounds, particularly sulfur dioxide, has been designed such that the acceptor material is freely accessible to the gas mixture passed through open gas channels; the structure of the apparatus is moreover of stronger construction than similar prior art devices. One or more containers comprising a sheet of a gas-permeable material folded into several S-shaped creases are situated in the units housing. Horizontal and vertical ladder type constructions which provide support for the gas-permeable sheet and form chambers for the solid material as well as open gas channels through which the gas mixture is passed are inserted into the S-shaped creases. (Author abstract modified)

36890 **APTIC NO. 59589**

Viland, Clare K.

PREVENTING AIR POLLUTION AND IMPROVING SAFETY OF AUTOMOBILE AND SIMILAR TANKS. *(Assignee not given.) U. S. Pat. 3,747,800. 6p., July 24, 1973. 9 refs. (Appl. Feb. 16, 1971, 5 claims).*

An evaporation-proof and crash-resistant gasoline tank for automobiles is described. It consists of an inner tank constructed of flexible material resistant to gasoline and to light oil. The inner tank may be attached tightly to the side walls of a conventional gasoline tank, preferably at the seam connecting the upper and lower halves of the tank. It is also tightly attached to the filler pipe at its inlet point. The upper half of the inner tank acts as a diaphragm and is formed in such a manner than when the tank is full, the diaphragm is forced up against the top of the tank, and when the gasoline tank is empty, it rests on the bottom of the tank. When the device is combined with fuel injection and the use of catalytic exhaust converters, it not only provides a better and more economical means of controlling undesirable auto emissions than do present methods, but also tends to reduce the load on the catalytic exhaust converters and relieve excessive heat. (Author summary modified)

36891 **APTIC NO. 59328**

Wagner, Manfred

STUDIES ON A PROCESS MODEL OF A REACTION SYSTEM FOR SO2 OXIDATION BY MEANS OF DIGITAL SIMULATION. *(Untersuchungen am Prozessmodell eines Reaktionssystems zur SO2-Oxydation mittels digitaler Simulation). Text in German. Preprint, VEB KIB Chemie, Stammbetrieb des VEB Chemieanlagenbau- und Montagekombinat Leipzig, 16p., 1973. 3 refs. (Presented at the Verfahrenstechnischen Jahrestagung, Halle, East Germany, June 27-28, 1973.)*

A process model for a reaction system for sulfur dioxide oxidation is described. The model permits the study of contact systems which are either in the planning stage or already in operation. The basis of the model is the partial differential equations for the energy and mass balance in heat exchangers and reactor zones. It has been established for adiabatic process conduction with negligible heat loss in the reactor. The heat storage of the contact mass is taken into consideration. The reaction is assumed to have a temperature dependent reaction speed and SO3 equilibrium concentration. A gas flow with uniform speed across the whole cross section is assumed. In the heat exchanger the heat losses are neglected. The average temperature difference is used as an approximation for the logarithmic temperature difference. The dependence of the coefficient of heat transmission of both flow velocities is taken into consideration. The program is written in Fortran 63 for the computer CDC 1604.

36892 **APTIC NO. 60052**

Wahl, Josef and Peter Juergen Schmidt

METHOD AND APPARATUS TO REMOVE POLLUTING COMPONENTS FROM THE EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Robert Bosch G.m.b.H., Gerlingen-Schillerhohe (West Germany)) U. S. Pat. 3,759,232. 16p., Sept. 18, 1973. 3 refs. (Appl. June 23, 1972, 45 claims).*

An automotive engine exhaust control method is described in which air and fuel are supplied to the inlet manifold of an internal combustion engine over a first path. The amount of air is controlled in accordance with a command input, for example to control operation of the engine. The oxygen content in the exhaust gases is measured, and additional air is applied to the inlet manifold of the engine over a second path. The amount of additional air being supplied over the second path is controlled in accordance with the amount of air admitted through the first path and with the measured oxygen content of the exhaust gases. This invention improves the control of the exhaust emissions and decreases the delay time of the closed control loop by making the response time of the control loop dependent on the amount of air being passed through the intake manifold over the direct air path. (Author abstract modified)

36893 **APTIC NO. 59695**

Weir, Alexander, Jr. and Lawrence T. Papay

SCRUBBING EXPERIMENTS AT THE MOHAVE GENERATING STATION. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73- 038, p. 357-392. (May 14-17.)*

Eight pilot plant scrubbers and four different reagents were studied in scrubbing experiments at the Mohave Generating Station, a coal-burning power plant. The scrubber/reagent combinations which seemed to offer the greatest chance of success were the turbulent contact absorber scrubber using limestone and the edison (SCE) scrubber using lime. A vertical module based on the TCA scrubber and a horizontal module based on the SCE module, both 450,000 scfm, were constructed based on the pilot data. Sulfur dioxide removal with lime slurry was from 400 ppm to 40 ppm for the horizontal module and from 250 ppm to 40 ppm for the vertical module. Removal of SO2 with limestone slurry was from 250-40 ppm for the horizontal and from 400-40 ppm for the vertical. Construction of two different test module systems appears to give a higher probability that a workable system for the entire plant can be developed in a reasonable time frame.

36894 **APTIC NO. 60099**

Wendtland, Peter

THE FLUE GAS MUST NOT BE SO TOXIC. *(Rauchgas muss nicht so giftig sein). Text in German. Umwelt (Duesseldorf), 3(6):28-29, 1973.*

Of the fuel oil which presently covers 57% of the total energy demand, about one-third is used in domestic heaters. This means that our heat comfort is paid for by a considerable amount of toxic gases. Of about 11,000 oil-fired heaters inspected in Zurich in the winter of 1971/72, only about one-half met the legal requirements. The worst polluters were the heaters erected between 1945 and 1955, while the least polluters were the heaters of the years 1966 to 1970. Meanwhile a number of new heaters are available which have been designed with special regard to reducing pollutant emissions. One heater tries to diminish the soot emission by deflecting the air flow twice by 90 deg. The carbon monoxide concentration is reduced through injection of secondary air to the second stage of the oil combustion process. With these measures the CO concentration is less than 0.01% and the soot number is zero. Variable mixing heads for burners allow combustion with very little excess air. Through atomization of water in the fuel oil, the emission of unburned particulates is said to drop by 90%, SO2 by 50%, and the oxides of nitrogen by 10 to 50%.

36895 **APTIC NO. 59861**

West, Norman Eugene

REMOVAL OF HF FROM AN HF-CONTAINING GAS. *(du Pont de Nemours (E. I.) and Co., Wilmington, Del.) U. S. Pat. 3,743,704. 2p., July 3, 1973. 4 refs. (Appl. May 12, 1971, 4 claims).*

A process for removing hydrogen fluoride from an HF-containing gas by scrubbing is described. The gas is scrubbed with water so that the HF enters the aqueous phase to form hydrofluoric acid, and the gas phase is vented as virtually HF-free gas. Precipitation of the fluoride ion in the aqueous solution as calcium fluoride is carried out by adding calcium hydroxide, calcium carbonate, or a mixture to the solution. Settling of the precipitate is improved by adding calcium sulfate to the aqueous solution during the reaction forming the precipitate. The precipitate is readily filterable. The aqueous phase which remains is virtually free of HF and can be used for scrubbing the HF-containing gas. The neutralization reaction which accompanies addition of Ca(OH)2 or CaCO3 to the aqueous solution can be carried out in two steps, first to partially neutralize the solution, e.g., pH up to six so that the solution is still able to be pumped to a settling tank, and second to complete neutralization in the settling tank. The CaSO4 addition can be postponed until the addition of Ca(OH)2, CaCO3, or their mixture to the settling tank. (Author abstract modified)

36896 **APTIC NO. 59994**

Westphal, Bernhard W. and Hans-Georg Norbisrath

THE INCINERATOR WUPPERTAL. *(Muellverbrennungsanlage Wuppertal). Text in German. Energie (Munich), 25(11):329-335, Nov. 1973.*

The layout and design of a new incineration plant at Wuppertal are described. The plant includes a stack gas scrubbing system. A blower draws combustion air from the storage bunker, creating an air flow into the bunker that keeps the discharge points free of dust and prevents the penetration of odors to the outside of the building. After cooling, the stack gases are brought through an electrostatic precipitator for dust removal and then through a scrubber for removal of hydrochloric acid.

36897 **APTIC NO. 60025**

Whitten, Charles M., Vaughn Mansfield, Louis J. Petrovic, and Jagdish C. Agarwal

COAL DESULFURIZATION PROCESS. *(Peabody Coal Co.) U. S. Pat. 3,759,673. 5p., Sept. 18, 1973. 4 refs. (Appl. Nov. 5, 1971, 6 claims).*

Coal is treated in a reducing atmosphere in a fluid bed reactor to partially devolatilize it, remove all moisture, and remove some hydrogen sulfide and sulfur dioxide. The then charred coal is treated in a multi-stage contactor with hot gas composed of hydrogen and methane to remove most of the remaining sulfur. The methane inhibits the reaction of the carbon with the hydrogen without effecting the desulfurization step and is derived from the partial devolatilization of coal. This is an improvement over past processes which used hydrogen at elevated temperature and pressure to remove sulfur, but which removed significant amounts of carbon. (Author abstract modified)

36898 **APTIC NO. 60212**

Wikdahl, Nils Anders Lennart

ARRAY OF CYCLONIC SEPARATORS. *(Assignee not given.) U. S. Pat. 3,747,306. 12p., July 24, 1973. 12 refs. (Appl. Sept. 17, 1970, 20 claims).*

A device consisting of an array of cyclonic separators have been designed to achieve more efficient space utilization than prior art arrangements. Separators are arranged in groups oriented about a common first geometric axis to which the geometric axis of each separator is preferably at one and the same angle. The groups of separators in turn are oriented about a second and different geometric axis which is preferably at one and the same angle to the first geometric axis of the groups. The orientation of the cyclonic separators in each group of separators is preferably the same as in the next adjacent group of separators so that all base ends face the same way and likewise the apex ends for opening into common base and apex end outlet collective chambers.

36899 **APTIC NO. 59590**

Williams, John T., Sr.

AIR POLLUTION CONTROL SYSTEM. *(Assignee not given.) U. S. Pat. 3,747,502. 5p., July 24, 1973. 11 refs. (Appl. June 14, 1971, 3 claims).*

A street-level and factory exhaust air handling system is described which utilizes existing underground sewers to draw off street level air and contaminating vehicle exhaust gases as well as gaseous factor waste. The system pumps the contaminated street level air and gaseous factory wastes upwardly through very tall smokestacks for jet discharging from the upper ends of the smokestacks into upper elevation air. It provides for more rapid dispersion and movement to remote areas by the higher velocity air currents which occur at high altitudes. (Author abstract modified)

36900 **APTIC NO. 59580**

Wilson, Harold W.

PROCESS FOR THE BENEFICIATION OF WASTE COPPER SLAG BY REMOVAL AND RECOVERY OF ITS CONTENT OF COPPER AND ZINC. *(Golden Cycle Corp.) U. S. Pat. 3,744,990. 5p., July 10, 1973. 8 refs. (Appl. Oct. 14, 1970, 13 claims).*

A process for the beneficiation of waste copper slag by removal and recovery of its content of Cu and zinc is described. The slag is used to trap sulfur dioxide from waste gases and is contacted with an aqueous solution of ammonia gas to remove the reactive Cu and Zn. The removal of the Cu by the aqueous NH3 solution is accomplished without the presence of any dissolved ammonium salts or the addition of air or other oxidizing agent to the reaction. After dissolving the Cu values and Zn values, they may be recovered from the gas solution by displacement. (Author abstract modified)

36901 **APTIC NO. 60082**

Wolff, W.

CORNER-TUBE-BOILERS FOR INCINERATORS. *(Eckrohrkessel fuer Muellverbrennungsanlagen). Text in German. Energie (Munich), 25(11):340-345, Nov. 1973. 8 refs.*

Corner-tube boilers are frequently used in cases where waste heat is to be utilized. In standard incinerators, the loose arrangement of the tubes and other factors cause low heat transfer and thus a larger boiler volume, i.e., a larger distance between the drum and boiler volume. In corner-tube boilers a large part of the circulating water, about 40 to 60%, does not flow through the drum but is passed directly to the distributors. Thus, a considerable number of connecting tubes between drum and boiler tube system are saved. Various incinerators combined with corner-tube boilers are described and illustrated.

36902 **APTIC NO. 60168**

Yamada, Mitsumasa and Hiroshi Sawada

AFTERBURNER FOR RECOMBUSTION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Toyota Jidosha Kogyo Kabushiki Kaisha, Toyota (Japan)) U. S. Pat. 3,759,668. 5p., Sept. 18, 1973. 5 refs. (Appl. Oct. 14, 1971, 10 claims).*

An afterburner for recombustion of unburned components of exhaust gases of an internal combustion engine is described. It consists of a burner including a mouth for producing and spouting a jet flame swirling about a longitudinal center line of the flame; a chamber associated with the burner for receiving the flame; a means in the chamber for introducing the exhaust gases into the chamber and for inducing the exhaust gases to rotate around the jet flame; a device mounted in the chamber and confronting the mouth for dispersing the flame radially with respect to the chamber and thereby mixing the jet flame with the rotating exhaust gases to make a mixture; and an outlet pipe mounted on the opposite end. The unburned components are burned within the chamber to clean the exhaust gases of the unburned components, and then the cleaned exhaust gases are discharged from the chamber through the outlet pipe. Conventional afterburners use an ignition plug to ignite the exhaust gases; they often experience trouble in firing the exhaust gases. This invention obviates this disadvantage of conventional afterburners by providing a stable flame which ignites the exhaust gas. This leads to improved efficiency. (Author abstract modified)

36903 **APTIC NO. 59972**

Yamanouchi, Naotoshi

SULFURIC ACID INDUSTRY AND RELATED INDUSTRIES FORCED TO CHANGE BECAUSE OF POLLUTION BY SOX. *(SOx taisaku ni yori henka suru ryusan to sono kanren kogyo). Text in Japanese. Kagaku Keizai (Chem. Ind. Econ.), 20(12):34-39, Nov. 1973.*

About 200,000,000 kl crude oil is imported to Japan annually. The combustion of this oil causes air pollution in Japan. Various countermeasures are being undertaken to reduce pollution including the reduction of sulfur content in the crude oil, desulfurization of heavy oils, the use of light oils for fuels, and the desulfurization of stack gases. Until recently, sulfur has been supplied to the sulfuric acid industry from sulfide ores in Japan. However, all the sulfide mines were closed by 1972 because of the increase of the amount of pure sulfur produced in the course of refining petroleum. Up to 1970, the sulfuric acid production continued increasing when production remained at 7 million tons. Up to 1955, almost all ammonium sulfate was produced from sulfuric acid and ammonia. However, the synthetic ammonium sulfate was completely replaced with by-product sulfuric ammonium sulfate by 1971. About 4 million tons of gypsum were supplied in 1971. Of this amount, about 500,000 tons are natural gypsum. The demand far exceeds the supply.

36904 **APTIC NO. 59478**

Bureau of Mines, Washington, D. C.

TECHNOLOGIC AND RELATED TRENDS IN THE MINERAL INDUSTRIES, 1972. *Bureau of Mines Information Circ., no. 8603:1-44, 1973. 7 refs.*

GPO

Recent trends and developments in the minerals industry are outlined. Topics covered include: exploration and extraction trends; liquid and gaseous fuel production; productivity; metallurgical trends; recycling, waste treatment, and environmental control; energy product utilization (coal gasification, alternative fuels); health and safety; and legislative actions. Coal preparation is reviewed under metallurgical trends, and mention is made of the trend in dust collection facilities at coal transfer points for compliance with Federal mine safety laws. Air pollution control developments in metallurgy, as for example, the installation of scrubbers on quenching towers and the equipping of coke oven batteries with preheating and smokeless pipeline charging equipment, are also reviewed.

36905 **APTIC NO. 60289**

Zabolotny, Ernest R.

ELECTROLYTIC PROCESS FOR DESTRUCTION OF ODOROUS IMPURITIES. *(Carrier Corp., Syracuse, N. Y.) U. S. Pat. 3,753,881. 6p., Aug. 21, 1973. 7 refs. (Appl. Sept. 4, 1970, 7 claims).*

A process for removing pollutant impurities and destroying oxidizable pollutants in a gas stream is described. It consists of contacting the gas stream with an electrolytically regenerable liquid stream capable of oxidizing the pollutants, separating the gas and liquid streams, and electrolytically regenerating the liquid stream whose oxidizing capability is reduced due to the destruction of the pollutants. The regenerated stream is recycled for further contact with additional pollutants. The improvement in this process is in subjecting the liquid stream on a periodic or continuous basis to a low temperature crystallization whereby pollutant impurities which accumulate in the system and certain oxidation products can be crystallized from the liquid stream, e.g., nitrogenous contaminants. Destruction of oxidizable pollutants also occurs at the electrodes of the regeneration means. (Author abstract modified)

36906 **APTIC NO. 60294**

Zabolotny, Ernest R.

ELECTROLYTIC CELL APPARATUS FOR THE DESTRUCTION OF ODOROUS IMPURITIES IN A GAS STREAM. *(Carrier Corp., Syracuse, N. Y.) U. S. Pat. 3,755,130. 5p., Aug. 28, 1973. 8 refs. (Appl. Sept. 4, 1970, 4 claims).*

In combination with a contact zone for the mass transfer of pollutant or odorous materials from a gas stream to an aqueous acid stream containing cobalt(III), the Co(III) oxidizes the pollutant or odorous materials and is reduced to Co(II). An electrolytic regeneration apparatus is provided for continuous electrolytic regeneration of Co(II) to Co(III). The pollutants or odorous materials are also continuously destroyed at the electrodes of the electrolytic regeneration apparatus. The regeneration apparatus comprises a Co(III) and acid-resistant container to receive the Co(III) acid stream with lead anodes and cathodes supported in the interior of the container which contact the Co(III) acid stream during electrolytic regeneration of Co(III) and pollutant destruction. The area of the anodes is such that upon the passage of electrical current through the electrolytic apparatus, the regeneration of Co(III) from Co(II) in the aqueous acid stream is the predominant reaction. Prior electrolytic cells did not use an electrolytic cell for the destruction of pollutants or odors and did not use electrolytic cells for the electrolytic regeneration of Co(III) which was reduced to Co(II) during oxidation of pollutants or odors. (Author abstract modified)

36907 **APTIC NO. 59588**

Zarfoss, James R., Earle S. Snader, and Elden A. Hale, Sr.

CLOSURE FOR EXHAUST STACK. *(Koppers Co., Inc., Pittsburgh, Pa.) U. S. Pat. 3,745,907. 9p., July 17, 1973. 4 refs. (Appl. May 17, 1971, 1 claim).*

A stack closure is described for closing the exhaust end of an exhaust stack to prevent the exhaust of gases from the stack and for opening the exhaust end when desired. A pivotable support frame is connected to a base member located at the exhaust end. A cap is connected to the frame by a floating connection for providing random movement between the cap and the frame. The frame pivots to move the cap into and out of closing engagement with the base. The floating connection permits self-alignment of the cap with the base during closing. Resilient stabilizing members act to stabilize the random movement between the cap and the frame. A seal member seals the cap and base, and pressure limiters protect the seal member from excessive pressure exerted when the cap is in sealing engagement with the base. The cap is used in conjunction with an electrostatic precipitator. When the precipitator is in use this cap is closed to divert gases into the precipitator, and the pivotal closing permits quick opening to prevent backups if the precipitator becomes inoperable.

36908 **APTIC NO. 60108**

Zechnall, Richard, Peter Schmidt, and Josef Wahl

APPARATUS TO CONTROL THE PROPORTION OF AIR AND FUEL IN THE AIR-FUEL MIXTURE OF INTERNAL COMBUSTION ENGINES. *(Robert Bosch GmbH, Gerlingen-Schillerhohe (West Germany)) U. S. Pat. 3,745,768. 15p., July 17, 1973. 4 refs. (Appl. March 30, 1972, 27 claims).*

An apparatus for controlling the proportion of air and fuel delivered to internal combustion engines utilizing either fuel injection or carburetion has been developed to permit control over a wide range air-fuel composition (air number of 0.7-1.4) in response to oxygen partial pressure of the exhaust; prior art methods utilizing the measurement of carbon monoxide content have suffered from the disadvantage that fuel ratios in which the air number is greater than 1 cause only minor changes in CO content of the exhaust. The present invention involves placing an oxygen partial pressure sensor which includes an oxygen ion conductive solid electrolyte in the exhaust manifold, exhaust pipe, or muffler. An electronic control system which includes a low pass filter for averaging partial oxygen pressure differences resulting from nonuniformity of the exhaust is inserted between the sensor and the fuel control element.

36909 **APTIC NO. 59843**

Zey, Aubrey, F., Julius V. Przygocki, and Philip Van Huffel

SULFUR DIOXIDE COLLECTION SYSTEM. *(American Standard Inc., New York) U. S. Pat. 3,745,751. 5p., July 17, 1973. 10 refs. (Appl. Oct. 26, 1970, 1 claim).*

A sulfur dioxide collection system for treatment of high temperature stack gases is described. Ozone-producing electrodes are arranged in the gas duct so that hot gases directly wash the electrode surfaces, with the corona-produced ozone reacting with SO2 to form the more oxidized sulfur trioxide. The SO3 is then hydrolized to sulfuric acid mist which is collected by suitable means such as an electrostatic precipitator.

36910 **APTIC NO. 59459**

Singmaster and Breyer, New York

AIR POLLUTION CONTROL IN THE PRIMARY ALUMINUM INDUSTRY. VOLUME II OF II APPENDICES. *National Air Pollution Control Administration Contract CPA 70-21, EPA-450/3-73-004b, 243p., July 23, 1973. 21 refs.*

NTIS: PB 224283/AS

The appendices of a detailed report on air pollution control in the primary aluminum industry are presented. They include: data acquisition questionnaire, particle size/weight distribution, fractional removal efficiency curves, sampling and analytical techniques, method 13-determination of total fluoride emissions, Environmental Protection Agency source sampling, emission flow diagrams, removal equipment purchase costs, and sample calculation of industry control improvement costs.

36911 **APTIC NO. 59546**

United States Postal Service, Transportation Research

NATURAL GAS AND LPG FOR POSTAL VEHICLES. PROJECT NO. 704220. *Preprint, 73p., 1973.*

Results and recommendations are reported from a test program designed to evaluated the capabilities of natural gas and liquefied petroleum gas as low pollutant alternate fuels for postal vehicles. The results indicated that conversion of fleet vehicles to the use of natural gas could materially reduce vehicular pollution, prove cost beneficial in terms of maintenance savings and reliable performance, and still perform more efficiently than comparable gasoline engines currently being designed and fabricated with extensive emission control equipment. During the field evaluation phase of the program, the natural gas test vehicles achieved exhaust emission levels well below the 1974 Federal Standards when tested in conformance with 1971 Federal Test Procedures for new car hydrocarbon and carbon monoxide emissions. Control vehicles (gasoline powered) exceeded even the less restrictive Federal Standards of 1968. Neither group met the 1973 new car standards for oxides of nitrogen, although the natural gas vehicles operating in the field achieved an 8% reduction over the control gasoline vehicles.

36912 **APTIC NO. 59698**

PANEL DISCUSSION: SIGNIFICANCE OF OPERATION TO DATA OF 156-MW CHEMICO/MITSUI LIME SCRUBBING SYSTEM. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 451-474. (May 14-17.)*

A panel discussion is presented on the significance of operation to date of a 156 MW Chemico/Mitsui lime scrubbing system for the removal of sulfur dioxide from stack gas. Topics discussed include: pond saturation; lime/limestone buffering; operation of mist eliminators; Japanese versus American results; differences in variation of flue-gas flow rate and sulfur content of coals used in Japanese versus American operations; areas of common applications between the two countries; open versus closed loop operation; factors affecting pressure drop; and the problem of saturation.

36913 **APTIC NO. 59716**

PANEL DISCUSSION: DISPOSAL AND USES OF BY-PRODUCTS FROM FLUE GAS DESULFURIZATION PROCESSES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 931-960. (May 14- 17.)*

A panel discussion is presented on the disposal and uses of by-products from flue gas desulfurization. Topics covered include: the use of fly ash for construction materials; oxidation of sludge to gypsum; the ratio of fly ash to calcium sulfite or sulfate; the use of sulfur in surface bond construction; the possibility of building fertilizer plants at power plants or smelters and the economic effects on the market; the hazards of storing large amounts of sulfur; the disposal of baghouse waste products; the use of sodium sulfate as a soap binder; landfill preparation for stockpiling sulfur; and the leaching into the soil of heavy metals.

36914 **APTIC NO. 59732**

Vatavuk, William M.

NATIONAL EMISSIONS DATA SYSTEM (NEDS) CONTROL DEVICE WORKBOOK. *Office of Air and Water Programs, Research Triangle Park, N. C., Office of Air Quality Planning and Standards, APTD-1570, 225p., July 1973. 11 refs.*

The pollutant control devices and methods most commonly used by the majority of the industries, processes, and facilities grouped under the Source Classification Categories as defined by the National Emissions Data System of the Environmental Protection Agency are identified. Data for each category include the name of the source classification category, the source classification code, the control equipment identification number, the mean control device efficiency for particulates, sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons, the range of observed control efficiencies, and the data source from which the information was obtained. These data are intended to be used in the preparation of emission inventories or other similar studies and do not necessarily reflect the extent of pollutant control at any single facility. (Author abstract modified)

36915 **APTIC NO. 59755**

Tennessee Valley Authority, Chattanooga, Tenn.

FULL-SCALE DESULFURIZATION OF STACK GAS BY DRY LIMESTONE INJECTION. VOLUME I. (FINAL REPORT). *Environmental Protection Agency Interagency Agreement TV-30541A, EPA-650/2-73-019-a, 232p., Aug. 1973. 104 refs.*

Dry limestone injection was tested on a 150 Mw pulverized coal-fired boiler at the Tennessee Valley Authority's Shawnee Plant. The program included equipment shakedown, dust distribution studies, process optimization, and long-term injection trials. Major process variables were evaluated; the distribution of lime dust in the boiler, the effect of operating variables on distribution, and resulting effects on sulfur dioxide removal were studied; the sensitivity of SO2 removal to key operating and process variables was evaluated; conditions for optimum SO2 removal were determined; process effects on boiler operation and maintenance, on solids collection equipment, and on water quality were studied; and a process economics study was completed. The program is discussed in context with previous investigations. Appendices contain test program results and results of other studies. Because of low SO2 removal efficiencies and the potential for major reliability problems, dry limestone injection will probably not play an important role in controlling SO2 power plant emissions.

36916 **APTIC NO. 59816**

LEGISLATION - REGLEMENTATION. *(Legislation - Reglementation). Text in French. Pollut. Atmos. (Paris), 15(60):464-468, Oct.-Dec. 1973.*

Decisions made by Council of State of France on Oct 11, 1972, concerning environmental protection for petroleum refineries and petrochemical plants are presented. High torches in petroleum refineries and petrochemical plants must be equipped with adequate devices for the separation of liquids from the gases to be burned off, and for the suppression of smoking, e.g., by the injection of steam. Smoking should be checked every 5 min, and continuous recording of the hydrogen sulfide content in the waste gases to be burned is required. The smoke index should not be higher than one Ringelmann unit during not more than 2% of the total annual operation time. Ground torches should be equipped with a special combustion system and a circular screen for the improvement of the combustion conditions and flame sheltering.

36917 **APTIC NO. 60054**

ENVIRONMENTAL CONTROL MEASURES IN MIZUSHIMA IRONWORKS, KAWASAKI STEEL CORPORATION. *(Waga-sha no kankyo kanri taisaku, Kawasaki Seitetsu, Mizushima Seitetsusho no maki). Text in Japanese. Tekkokai (Iron and Steel Ind.), 23(11):122-127, Nov. 1973.*

The environmental control program of the Mizushima Ironworks is outlined. It includes a forestation program, air pollution control, and water pollution control. So far, 150,000 sq m of the premises have been planted with 40,000 trees. Air pollution control facilities include water spray guns for the unloader, conveyor, and coal yard, and 130 dust collectors for the grinding plant, baking plant, blast furnaces, and converters. A waste water disposal process and the recirculation of scrubbing and cooling water help prevent water pollution. Nitrogen oxides control methods are now being considered.

36918 **APTIC NO. 60115**

NON-POLLUTING THERMAL ENGINES. *(Moteur thermique non polluant). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), no. 186:105-108, Nov. 1973.*

Techniques concerning the use of hydrogen as a fuel in internal combustion engines, and the storage of hydrogen are described. The dwindling fossil fuel resources will make hydrogen, available in abundant supply, the fuel of the future. Hydrogen as a fuel can be used both in internal combustion engines and other thermal equipment, and in fuel cells for energy generation. When burned, hydrogen produces no pollution, and the combustion product, water, can be repeatedly decomposed into hydrogen and oxygen for reuse. Storage of hydrogen in metal hydrides seems to be the safest form. The chemical equilibrium between the synthesis and dissociation of metal hydrides, such as of nickel lanthanide, magnesium, vanadium, and niobium, can be controlled by the temperature of the system. According to the selected support, pressures between one and several hundred atm can be obtained in a temperature range of 20-300 C.

36919 **APTIC NO. 60324**

California Legislature, Sacramento, Assembly Office of Research

CALIFORNIA STEAM BUS PROJECT. FINAL REPORT. *31p., Jan. 1973.*

The California Steam Bus Project is reviewed. Its purpose was to evaluate the technical feasibility and public appearance of the external combustion engine (ECE) as a low-emission, quiet propulsion system, using city buses as demonstration vehicles. Three buses equipped with Rankine cycle steam engines traveled 8372 road miles under steam power, including about 800 miles in revenue passenger service in Oakland, San Francisco, and Los Angeles. Steam bus acceleration, top speed, and hill climbing were equal to or exceeded road performance of buses powered by six-cylinder diesel engines. All steam buses emitted less pollutants than allowed by the 1975 California emission standards for heavy duty vehicles, but none of the diesel buses tested came close to meeting the requirements for hydrocarbons and nitrogen oxides combined. When the cleanest steam bus was compared to a composite of the cleanest diesels tested, the steam bus produced 30.5% less carbon monoxide and 86% less HC and NOx. The cleanest steam bus had 94% less NOx compared to the cleanest diesel. The steam buses consumed more than three times as much fuel as diesels. Steam buses duplicated schedules of diesel buses in actual revenue service and gas satisfactory safety and comfort performance. The steam buses generally equalled road performance of diesel buses. Public attitude surveys showed concern about pollution and favorable acceptance of the steam buses.

1972

36920 **APTIC NO. 60042**

Andersson, Per-Erik and Carl Arne Bergholm

PROCESS AND DEVICE FOR RECOVERING SULFUR DIOXIDE FROM WASTE SULFITE LIQUOR. *(Svenska Cellulosa Aktiebolaget, Sundsvall (Sweden)) U. S. Pat. 3,675,707. 8p., July 11, 1972. 9 refs. (Appl. Dec. 8, 1969, 4 claims).*

A method for recovering sulfur dioxide in quantities economically useful from sulfite waste liquors resulting from the production of cellulose pulp is presented. The sulfite waste liquor is concentrated in a plural effect evaporator; and the vent steam which contains SO2 is cooled at low pressure, the condensate being discharged. The resulting gas which is rich in SO2 is compressed to atmospheric pressure in a vacuum pump requiring little or no sealing water. (Author abstract modified)

36921 **APTIC NO. 59586**

Aono, Shigeo

CRANKCASE BLOW-BY GAS RECIRCULATING DEVICE. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,673,994. 7p., July 4, 1972. 10 refs. (Appl. June 30, 1970, 5 claims).*

An improved crankcase blowby gas recirculating device is described which is adapted to reduce the quantity of hydrocarbons contained in the engine exhaust gases. It interrupts the recirculation of the blowby gases from crankcase to the intake manifold during idling and decelerating operations of the automobile, whereby the air pollution resulting from the emission of increased amount of unburned HC in the engine exhaust gases can be considerably eliminated. There is a regulating device in the recirculating passage which closes the passage during decelerating and idling operations. The device operates in relation to the angular position of the carburetor throttle valve or the vacuum in the intake manifold. The device can be used in combination with an internal combustion engine having a carburetor or a fuel injection system.

36922 **APTIC NO. 59857**

Barker, Thomas D. and William K. Ojala

EXHAUST GAS RECIRCULATION CONTROL MECHANISM. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,678,909. 6p., July 25, 1972. 7 refs. (Appl. Dec. 21, 1970, 18 claims).*

An exhaust gas recirculation control mechanism has been designed to control recirculation during all phases of internal combustion engine operation. A lever is mounted pivotally on a spacer located between the carburetor and the intake manifold of a reciprocating internal combustion engine, and a cam is mounted pivotally on the lever. The cam positions a poppet-type valve that determines exhaust gas recirculation rate. A vacuum motor responding to intake manifold pressure acts on the lever to position the cam which is directly connected to the carburetor throttle linkage. (Author abstract modified)

36923 **APTIC NO. 60057**

Bauger, Louis Jules, Roland Robert Charles Beyler, Henri Le Guen, Jacques Eloi Pidebois, and Michel Bernard Schenher

DEVICE FOR BURNING THE UNBURNT RESIDUE IN THE EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Societe National De Etude et de Construction de moteurs D Aviation, Paris (France)) U. S. Pat. 3,677,013. 7p., July 18, 1972. 6 refs. (Appl. Dec. 28, 1970. 14 claims).*

An afterburner device for achieving complete combustion and attendant pollutant reduction of internal combustion engine emissions has been developed to overcome prior art difficulties associated with ensuring a homogenous mixture of introduced fresh air and exhaust gas. An annular channel is formed between an inner electrode and a conducting wall insulated electrically from the wall of the combustion chamber, and the exhaust gases, to which air may have been added, pass through the channel where sparks jump between the inner and outer electrode. The inner electrode is connected to the conducting wall by conducting vanes which impart a rotational movement to the gases in the annular channel, and the sparks jump in a restricted outlet of the annular channel located between the wall of the combustion chamber and a wider downstream portion of the inner electrode. (Author abstract modified)

36924 **APTIC NO. 60095**

Bayze, Thomas F.

AIR POLLUTION CIRCULATION DEVICE. *(Assignee not given.) U. S. Pat. 3,678,658. 5p., July 25, 1972. 9 refs. (Appl. June 22, 1970, 1 claim).*

A recirculation system for washing and drying contaminated air from industrial furnaces and automobile exhausts has been designed for the removal of solid and gaseous contaminants from such sources in a manner superior to prior art devices. The apparatus utilizes a water or liquid solution treatment with repetitive drying and condensing out of liquid solvable materials before exhausting to the atmosphere the cleaned air or flue gases. The device consists of a duct structure having an inlet and outlet portion and containing several low pressure zones spaced along its length. Several gas agitators, each consisting of a container for a liquid solution and a rotating wheel at least partially submerged in the liquid solution, are positioned such that one is downstream of each low pressure zone. A dryer and solid particle collector comprise a portion of the duct downstream from the last agitator, and a means for recirculating the cooled and washed gases at the outlet portion of the duct back to the inlet portion is provided for recirculation with new exhaust gases. A pressure release valve is connected to the collector for releasing the cooled and washed gases to the atmosphere.

36925 **APTIC NO. 59447**

Blankenship, Charles P. and Robert R. Hibbard

STATUS REPORT ON THE NASA-EPA AUTOMOTIVE THERMAL REACTOR TECHNOLOGY PROGRAM. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-68010, 40p., Jan. 1972. 14 refs.*

NTIS: N72-17844

The current status of the National Aeronautics and Space Administration-Environmental Protection Agency automotive thermal reactor technology program is summarized. Engine dynamometer tests of candidate metals and coatings indicated that two ferritic iron alloys (GE 1541 and Armco 18-SR) and a nickel-base alloy (inconel 601) offer promise for reactor use; none of the coatings evaluated warrant further consideration. Developmental studies on a ceramic thermal reactor appeared promising based on initial vehicle road tests. A chemical kinetic study has shown that gas temperatures of at least 900-1000 K are required for the effective clean-up of carbon monoxide and hydrocarbons but that high temperatures require shorter combustion times and thus may permit smaller reactors. (Author abstract modified)

36926 **APTIC NO. 59557**

Blazowski, William S. and Robert E. Henderson

ASSESSMENT OF POLLUTANT MEASUREMENT AND CONTROL TECHNOLOGY AND DEVELOPMENT OF POLLUTANT REDUCTION GOALS FOR MILITARY AIRCRAFT ENGINES. *Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Air Force Aero Propulsion Lab., Proj. 3048-3066, Task 304805/306605, AFAPL-TR-72-102, 62p., Nov. 1972. 21 refs.*

NTIS, DDC: AD 753095

The problem of mass emissions from aircraft gas turbine engines is reviewed. Aspects of this problem which are unique to military aircraft operation are discussed. Pollutant measurement technology and the existing data base are presented, and candidate control techniques are identified. Piston, nonafterburning turbine, and afterburning turbine engines are compared with reference to their emissions of hydrocarbons, carbon monoxide, visible smoke, oxides of nitrogen, and other pollutants. Measurement techniques used are nondispersive infrared spectrometry for CO, carbon dioxide, and nitric oxide; flame ionization detector for HC; and nondispersive ultraviolet spectrometry for nitrogen dioxide. Sampling systems, remote monitoring, and laser remote sensing are also mentioned. Control technology for nonafterburning turbines include major and minor combustor redesign, controlled fuel injection, water injection, and compressed air bleed. Future technology will include variable-geometry combustor, staged fuel injection, and premix combustion. Fuel additives are another possible control method. Proposed Environmental Protection Agency regulations for aircraft engine emissions are examined in terms of their impact and application to military engines. Special considerations, both performance annd otherwise, which must be afforded to military aircraft, prohibit direct application of the EPA regulations. Appropriate research and development efforts are underway to supplement the emission-reducing advances in the commercial sector. In light of these efforts, Air Force emission limitation goals were set up for maximum allowable idle combustion inefficiency, NOx emission, and smoke number. (Author abstract modified)

36927 **APTIC NO. 60009**

Borhan, Gh. and C. Stanciu

DESIGN IMPROVEMENTS OF ELECTROSTATIC PRECIPITATORS OF THE BRAILA STAGE I POWER PLANT WITH RESPECT TO INCREASING THE SEPARATION EFFICIENCY. *(Imbunatatiri constructive ale instalatiilor de precipitare electrostatica de la C.C.H.-Braila, etapa I, in vederea maririi randamentului de reteinere). Text in Romanian. Celul. Hirtie (Bucharest), 21(11):582-587, Nov. 1972. 5 refs.*

Improvements in design of the electrostatic precipitators used at the Braila power plant are presented. The improvements concerned the gas distribution installation. Thirty-two spiral electrodes of chromium and nickel wire were introduced between the precipitation electrodes in order to secure a higher resistance to corrosion. In order to increase the efficiency of the electric filters sedimentation electrodes were made with large surfaces. Alkaline dust is shaken off the electrodes by means of transverse hammers with free drop.

36928 **APTIC NO. 60073**

Bowman, Vernon D.

AIR HEATER AND EXHAUST GAS DILUTING APPARATUS FOR INCINERATOR. *(Bowman Enterprises, Inc., Baltimore, Md.) U. S. Pat. 3,678,869. 5p., July 25, 1972. 4 refs. (Appl. Sept. 25, 1970, 3 claims).*

An air heater and exhaust gas diluting apparatus for use with an incinerator equipped with an exhaust gas purifier and scrubber has been designed to utilize the heat generated by the combustion of material in the incinerator itself, thereby greatly increasing efficiency and reducing operational cost. One or more outer walls of the incinerator are formed with spaced wall plates with baffles positioned to form a tortuous air passage between the spaced wall plates. A duct is connected between the air passage and the exhaust gas chamber of the incinerator, and a fan is used to draw air through the tortuous passage for discharging it to the exhaust gas chamber to achieve heat addition and exhaust gas dilution. (Author abstract modified)

36929 **APTIC NO. 60085**

Browder, Timothy J., Jr.

METHOD OF MANUFACTURE OF SULFUR DIOXIDE FROM SULFUROUS MATERIALS CONTAINING NITROGEN COMPOUNDS. *(Parsons (Ralph M.) Co., Los Angeles, Calif.) U. S. Pat. 3,682,593. 4p., Aug. 8, 1972. 7 refs. (Appl. Nov. 10, 1969, 14 claims).*

A method for the contaminant-free recovery of sulfur dioxide from process gas streams containing nitrogen compounds as well is presented. The nitrogen compounds are oxidized to nitrogen oxides concurrently with the conversion of sulfur to sulfur dioxide and then reduced to inert nitrogen in the presence of a reducing agent. The formed SO2 may be readily separated from the nitrogen and recovered as much or may be converted by conventional means to other sulfur compounds such as sulfur trioxide, sulfuric acid, and oleum without the need for separation of inert nitrogen which passes unchanged through the processing system. Incineration temperature is normally above 900 F, and the reducing zone is generally operated between 1600 and 2200 F.

36930 **APTIC NO. 60056**

Bryk, Petri, Martti Haani, Jorma B. Honkasalo, Jorma Kinnunen, Olle Lindsjo, Erik Nyholm, Jaakko Poijarvi, Jussi Rastas, and Juhani Kangas

PROCESS FOR REMOVAL AND RECOVERY OF MERCURY FROM GASES. *(Outokumpu Oy, Outokumpu (Finland)) U. S. Pat. 3,677,696. 4p., July 18, 1972. 3 refs. (Appl. May 7, 1971, 2 claims).*

A scrubbing process for the removal and recovery of mercury from gas streams, particularly gases created in the oxidative roasting of sulfide ores, has been developed which eliminates the need for a disproportionately large cooling system for condensation of the metal vapor. Mercury-containing gases which have undergone the normal dry dust separation are conducted to a special wash tower where they are washed with a circulating sulfuric acid solution which is at least 80% concentration by weight. The temperature of the circulating wash solution saturated with metal sulfates and other metal salts is regulated during the washing phase with the circulation rate and outside heat exchange so that the Hg contained in the incoming gas can be made to sulfatize and form mercuric compounds as completely as possible. Dilution of the wash water can be prevented if the temperature is adjusted so that the water vapor pressure of the wash solution during the washing phase is the same as the partial pressure of the water vapor contained in the gas to be washed; this generally is in the range of 70-170 C. The solid material is then separated from the circulating wash solution and recovered.

36931 **APTIC NO. 60055**

Buschman, Elmer W.

ELECTROSTATIC PRECIPITATOR. *(Assignee not given.) U. S. Pat. 3,678,653. 10p., July 25, 1972. 27 refs. (Appl. May 11, 1970, 14 claims).*

A parallel plate electrostatic cell for the precipitation chamber of a two chamber electrostatic precipitator has been designed to achieve a degree of ruggedness and economy of space not attainable with prior art parallel plate cells. The cell is composed of several modular electrode units in the form of louvered plates which have reinforcing ribs and projecting vanes mounted so that the vanes of one plate are interleaved with the vanes of an oppositely charged plate and so that the plates are in parallel and insulated relationship to each other. The projecting vanes form several open air passages with several electrostatic fields across the passages. (Author abstract modified)

36932 **APTIC NO. 60058**

Carlson, Edgar and William R. Lehrian

HYDRODESULFURIZATION UTILIZING MULTIPLE HYDROGEN RECYCLE STREAMS. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,676,333. 6p., July 11, 1972. 7 refs. (Appl. March 26, 1970, 7 claims).*

A novel hydrocarbon desulfurization process for the recovery of high purity hydrogen sulfide by-product has been developed to overcome hydrocarbon contamination of the by-product stream and severe corrosion problems in the hydrodesulfurization feed heater associated with prior art methods. A portion of the effluent gas from the hydrodesulfurization process is treated for removal of H2S and admixed with the hydrocarbon fraction before entry into the feed heater. Untreated effluent gas containing hydrogen and H2S is then admixed with the preheated hydrocarbon H2 mixture prior to entry into the reactor. Treating only that portion of the effluent gas which passes through the heater minimizes coking and corrosion problems in the heater and reduces the effort required for treating the recycle gas. (Author abstract modified)

36933 **APTIC NO. 59801**

Cole, Edward N.

EXHAUST EMISSION CONTROL. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,674,441. 4p., July 4, 1972. 10 refs. (Appl. Nov. 9, 1970, 7 claims).*

A two-stage exhaust emission control device is described for use with engines equipped with catalytic converters. Internal combustion engine exhaust gases, passing unconverted through an exhaust gas catalytic converter during the warm-up period of the catalyst bed, are directed to a bed of storage material which separates and retains undesirable constituents of the exhaust gases. After warmup of the catalyst bed, the retained constituents are purged from the storage bed and recirculated to and converted in the catalyst bed. The storage bed supplements the emission control of the catalyst bed by reducing emission of undesirable exhaust gas constituents during starting of the engine and warm-up of the catalyst bed. (Author abstract modified)

36934 **APTIC NO. 59803**

Collins, John Joseph

ADSORPTION PROCESS FOR WATER AND NITROGEN OXIDES. *(Union Carbide Corp., New York) U. S. Pat. 3,674,429. 4p., July 4, 1972. 5 refs. (Appl. Jan. 6, 1971, 3 claims).*

An improved process for the adsorption of water and nitrogen oxides from stack gas streams is described. A dual adsorbent system of silica gel and a zeolitic molecular sieve is used. The formation of corrosive aqueous nitric acid in the adsorbent bed during regeneration is prevented by the use of a heat sink interposed between the gel and the sieve. The heat sink serves to prevent premature desorption of water from the silica gel bed and the contact of liquid water with desorbed nitrogen dioxide. (Author abstract modified)

36935 **APTIC NO. 59239**

Cordner, M. A. and D. H. Grimm

TRANSMISSION STUDY FOR TURBINE AND RANKINE CYCLE ENGINES. *Sunstrand Corp., Rockford, Ill., Sunstrand Aviation, Office of Air and Water Programs Contract 68-04-0034, APTD-1558, AER 657, 186p., Dec. 1972. 7 refs.*

The technical and economic feasibility of existing and potential types of transmissions most suitable for the gas turbine and Rankine cycle engines was investigated. Application of the engine/transmission was to a full-size family car. The study was accomplished through a two phase, multi-task programs which included: evaluation of transmission types through a feasibility study and ultimate selection of a transmission types; evaluation of the selected transmission type through design calculations and layouts, performance analysis, control system analysis, and cost analysis. A number of different types of transmission were initially evaluated including conventional multi-shift, hydrostatic, hydrokinetic, electric, belt/chain, hydromechanical, and traction types. (Author abstract modified)

36936 **APTIC NO. 60059**

Cremer, Walter

DUST COLLECTOR FOR A BY-PRODUCT COKE OVEN. *(Heinrich Koppers Gesellschaft mit beschrankter Haftung, Essen (West Germany)) U. S. Pat. 3,676,305. 6p., July 11, 1972. 4 refs. (Appl. Nov. 26, 1969, 8 claims).*

An apparatus for the collection of dust formed on pushing coke from by-product coke oven chambers of a regenerative coke oven battery has been designed such that it may be installed in existing by-product coke plants without substantial structural changes. The device includes a first hood which is movable with and positioned over the coke guide and a second hood positionable in overlying relation with an opening in the first hood and enclosing the quench car and locomotive. The second hood is supported on tracks located at ground level and is movable longitudinally along the coke oven battery in parallel relation to the longitudinally extending platform. A dust removal apparatus is supported by the second hood and includes conduits connected to the first hood for exhausting dust from both. (Author summary modified)

36937 **APTIC NO. 59452**

Culpepper, M. M. and W. A. Wilvert

ENGINEER DESIGN TESTS OF DUST-CONTROL MATERIALS AND EMPLACEMENT EQUIPMENT. (FINAL REPORT). *Army Engineer Waterways Experiment Station, Vicksburg, Miss. and Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., Army Material Command Proj. 1G664717DH01, Task 12, Task 13, Misc. Paper S-72-14, 47p., June 1972. 1 ref.*

NTIS, DDC: AD 745086

The engineer design tests of two dust-control materials, a polyvinyl acetate (PVA) water emulsion and a cationic asphalt neoprene emulsion (CANE), and two distributors, one pneumatic and one mechanical, that were used to apply the PVA and CANE, are described. Both distributors were used to apply the PVA and CANE with no reinforcing, with fiberglass scrim reinforcing, and with pre-chopped fiberglass reinforcing to sand and clay soils in the intermediate climate. The materials were allowed to cure for 4 hr and then subjected to the simulated airblast of a helicopter, an aircraft, and 1/4 and 2 and 1/2 ton vehicles. Only minor deficiencies in the PVA and CANE (instability in storage, excessive runoff, and tackiness after 4 hr curing time) were observed. The pneumatic distributor sprayed both materials with ease, but the mechanical distributor encountered difficulty in spraying CANE. Generally, the film-forming dust-control materials PVA and CANE were useful in preventing fugitive dust caused by the helicopter, aircraft, and truck airblasts. (Author summary modified)

36938 **APTIC NO. 60036**

Deacon, James S.

METHOD AND APPARATUS FOR REMOVING ENTRAINED DUST PARTICLES FROM A GASEOUS STREAM. *(Assignee not given.) U. S. Pat. 3,675,397. 7p., July 11, 1972. 6 refs. (Appl. Dec. 9, 1970, 6 claims).*

A wet-type dust scrubber for purification of dust-laden gases has been designed to overcome disadvantages of prior art venturi type scrubbers relating to clogging of nozzle orifices, erosion of venturi threat surfaces, and the ability to handle wide variations in stream velocity. Water droplets are introduced into the particle laden gaseous stream upstream of the venturi throat by means of rotating drums having a lower surface portion immersed in a water trough. The rotating drums pick up water on their surfaces and propel small droplets tangentially outward in the form of a spray. The venturi throat is defined in part by a pair of rollers journaled for free rotation and having parallel axes spaced so that adjacent surfaces of the rollers define a restriction between them. The force of the surface friction between the roller surfaces and the moving stream causes free rotation of the rollers thus reducing frictional resistance to stream flow and distributing erosion over a relatively large area. (Author abstract modified)

36939 **APTIC NO. 59235**

Debrun, G.

PREVENTION OF AIR POLLUTION BY DUST IN THERMAL POWER PLANTS. *(Prevention de la pollution par les poussieres. Cas des centrales thermiques). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 14p. 11 refs. (May 3-5.)*

Problems of the abatement of air pollution, especially such caused by particulate matter, in thermal power plants are discussed. The steady reduction of the quantity of solid fuels, and a parallel increase in the amount of fuel oil, and of nuclear energy will result in a reduction of the fly ash emissions. The fly ash production from coal-firing power plants has declined from 1,357,000 tons in 1967 to 1,190,000 tons by 1970 due to the reduction of the amount of coal used from 11,700,000 tons to 10,000,000 tons. The average concentration of the fly ash in the flue gases lies at 10 g/N cu m. While hydraulic dust separators have been completely abandoned, mechanical ones, such as multicyclones, are used as a last stage in combination with electrostatic dust precipitators which latter reach efficiencies of 96.4-98.4% under practical conditions. While fuel oil-fired thermal power plants emit rather small quantities of fly ash (an average concentration of 0.05 g/N cu m may be assumed), they produce considerable amounts of sulfur dioxide, sulfur trioxide, and smoke. The rate of SO3 formation can be minimized by reducing the air excess coefficient to below 1%, which, however, results in increased generation of unburned hydrocarbons. The SO2 emissions can be effectively abated by the addition of ammonia, dolomite, or magnesia at expenditures usually smaller than 1 kg/ton of fuel oil. In France, mixed combustion equipment only are required to be equipped with dust separators, while no dust separator is prescribed for fuel oil-fired power plants. Installation of dust separators for oil-fired power plants, and increase of the discharge temperature of the flue gases are the basic tasks to be achieved in the emission abatement area in the future.

36940 **APTIC NO. 59915**

Denis, Sylvain

SOME ASPECTS OF THE ENVIRONMENT AND ELECTRIC POWER GENERATION. *Rand Corp., Santa Monica, Calif., 33p., Feb. 1972. 8 refs.*

NTIS, DDC: AD 741605

A review of the available information concerning the relationship between electric power generation and the environment is presented in terms of the influence of the costs of pollution control on the cost of electricity and the influence of environmental constraints on the pattern of consumption of fossil fuels by electric utilities. Estimates of the production costs for a 800 Mw plant with different alternatives for sulfur dioxode control (low sulfur fuel, removal of SO2 from stack gases, nuclear generation) and for thermal discharge control (cooling ponds, wet or dry towers) are given, assuming a load factor of 80. The use of low sulfur coal seems more expensive than SO2 removal from stack gases, although the results are very sensitive to the load factor. The use of low sulfur coal becomes more likely as a given plant becomes older and is less used. Sulfur dioxide control costs are higher than those for thermal discharge control, except in the case of dry towers; the impact of both controls, however, is not a very large part of the consumer s cost. The impact is greater for the industrial sector since production costs are a large proportion of the consumer s cost in this sector.

36941 **APTIC NO. 60040**

Elkins, James L.

NON-POLLUTING EXHAUST SYSTEM FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,677,239. 5p., July 18, 1972. 12 refs. (Appl. June 24, 1970, 12 claims).*

A non-polluting, recirculating exhaust system for internal combustion engines has been designed to more effectively reduce exhaust pollutants and to remain effective after prolonged engine operation. Combustion products from the exhaust manifold of the engine are recirculated through a filter to a carburetor supplying a fuel mixture to the intake manifold. A metered flow of oxygen under pressure is supplied to the carburetor during engine operation for recharging the exhaust gas being returned to engine as part of the fuel mixture. The inflow rate of oxygen during engine operation is regulated by means of a vacuum control, while the recirculating conduit through which the exhaust gases are conducted is vented by a valve mechanism during periods when the engine is inactive or when the exhaust gas pressure becomes excessive. (Author abstract modified)

36942 **APTIC NO. 60090**

Gelbein, Abraham P. and Benjamin J. Luberoff

PURIFICATION OF GASES. *(Lummus Co., Bloomfield, N. J.) U. S. Pat 3,681,015. 4p., Aug. 1, 1972. 8 refs. (Appl. Jan. 21, 1970, 7 claims).*

A process for the removal of acid gas constituents such as carbon dioxide, hydrogen sulfide, and sulfur dioxide from gases rich in hydrogen and hydrocarbons (e.g., natural gas, synthesis gas) has been developed to incorporate an improved solvent system of low viscosity which can be readily regenerated and is non corrosive toward carbon steel. The acidic gases are removed from the gas stream by contact with a solvent consisting of an organic solvent which is liquid at room temperature, has a solubility for CO2 at 25 C, and atmospheric pressure of not less than one volume of CO2 per volume of solvent, and a secondary monohydric alkanolamine. The solvent has a boiling point at atmospheric pressure of at least 150 C and is unreactive with amines. It contains at least one functional group other than hydroxyl and is characterized by the presence of an element selected from oxygen, nitrogen, sulfur, or phosphorus. The functional groups present in the solvent molecule exceed the number of hydroxyl groups (when the molecule contains more than one hydroxyl).

36943 **APTIC NO. 60037**

Giarrizzo, Lawrence P.

EXHAUST FILTER ATTACHMENT. *(Assignee not given.) U. S. Pat. 3,675,398. 4p., July 11, 1972. 6 refs. (Appl. Oct. 15, 1970, 5 claims).*

An exhaust filter attachment adaptable for connection to the exhaust pipe of a motor vehicle for the reduction of gaseous and particulate emission components is described. Air is drawn inwardly or injected by the exhaust action of the gases expelled from the exhaust pipe, and the mixture is forced through a series of removable, cleanable filter members situated transverse to the flow. The filtering material is chemically treated to consume the poisonous gases, and a charcoal filter is mounted at the end of the device. Adequate drain mesh screens are provided in the spaces between the filtering elements and the charcoal material for elimination of water accumulation and for observation of particle accumulation to determine when cleaning is necessary. (Author abstract modified)

36944 **APTIC NO. 59585**

Gleason, Thomas G.

GAS SCRUBBER. *(Combustion Equipment Associates, Inc., New York) U. S. Pat. 3,673,769. 4p., July 4, 1972. 3 refs. (Appl. July 17, 1970, 7 claims).*

A gas scrubber is described which has a minimum number of moving parts and which can be fabricated and installed with relative ease while requiring minimum maintenance. Such scrubbers are suitable for general purpose use, but are especially useful for incinerators, particularly those in apartment buildings. Other scrubbers suitable for apartments usually require a pump for recycling water to provide the scrubbing action and a high rate of spray injection for effective washing to of the gas. The entering gas is driven through a turbulent bed of water and impinges on a submerged baffle to aspirate the gas and water upwardly through slots which impart a cyclonic flow to the water entrained gas to effect a spinout of the solids which collect in the surge tank and the cleaned gas is discharged. (Author abstract modified)

36945 **APTIC NO. 59253**

Gordon, J. S., R. D. Glenn, S, Ehrlich, R. Ederer, J. W. Bishop, and A. K. Scott

STUDY OF THE CHARACTERIZATION AND CONTROL OF AIR POLLUTANTS FROM A FLUIDIZED-BED BOILER -- THE SO2 ACCEPTOR PROCESS. (FINAL REPORT). *Pope, Evans and Robbins, Inc., Alexandria, Va., Environmental Protection Agency Contract CPA 70-10, Program Element 1A2013, EPA-R2-72-021, 303p., July 1972. 36 refs.*

A sulfur dioxide acceptor process was developed which is an atmospheric pressure, coal-fired fluidized bed boiler concept for steam and power generation. Coal is burned in a fluidized bed of crushed lime in the boiler s primary combustion zone; the partially sulfated lime is continuously regenerated (by reductive decomposition) in another zone. High combustion efficiencies are achieved by recycling, to a Carbon Burnup Cell, the carbon-containing fly ash which is carried out of the primary combustion zone. Experimental work was conducted in a 100 lbs coal/hr batch combustor and in a continuous 800 lbs coal/hr pilot boiler, to demonstrate system operability including: high degrees of sulfur removal in the primary combustion zone; high levels of SO2 in the off-gases from the regeneration zone, suitable for sulfur recovery; and high combustion efficiencies. Preliminary designs and cost estimates are presented for 30 Mw and 300 Mw boilers. The boiler is advantageous in the control of nitrogen oxides, hydrocarbons, carbon monoxide, and other pollutants, as well as SO2. The boiler operates at high ari rates and can achieve 99+% combustion efficiency.

36946 **APTIC NO. 60061**

Hawryluk, Alexandra S. and John Hawryluk

GAS PURIFIER UNIT. *(Control Research Products, Inc.) U. S. Pat. 3,675,396. 7p., July 11, 1972. 4 refs. (Appl. May 5, 1970, 11 claims).*

A gas purifier unit for the scrubbing of large volumes of stack gases has been designed to be virtually maintenance free, operate on a cleansing liquid that can be recycled, and achieve greater economy than prior art devices for such applications. Intermixing of the cleansing fluids and the gas to be purified is conducted on a continuous basis, and the stream of incoming impure gases is broken up into several fine gas bubble streams which pass upwardly through a body of cleansing liquid. The purifier housing is preferably made of stainless steel and has a central cylindrical section, an exhaust outlet at the top, and a lower waste receiving section at the center of which a cylindrical drain is disposed.

36947 **APTIC NO. 59544**

Heise, Carl J.

DUAL TURBINE-BATTERY ELECTRIC VEHICLE DRIVE SYSTEM. *American Chemical Society, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1103-1110. 2 refs. (Sept. 25-29, Paper 729164.)*

Design characteristics and performance test results are presented for a dual gas turbine-battery electric drive test vehicle developed by the Army. The drive system employs two heat engines and allows for operation of only one of the engines during part load runs in order to achieve minimum fuel consumption and exhaust emission. The energy storage capability of the battery can be used to supply the acceleration demands of the vehicle, thus permitting an engine rating which is substantially smaller than that of its mechanical counterpart. An electric transmission makes wheel speed independent of engine speed and hence eliminates the increase in pollutants which normally occurs during acceleration and deceleration.

36948 **APTIC NO. 60101**

Hensler, Paul

INSTALLATION IN INTERNAL COMBUSTION ENGINES FOR PREVENTING THE ESCAPE OF FUEL OUT OF THE MIXTURE FORMATION SYSTEM INTO THE ATMOSPHERE. *(Firma Dr.-Inq. h.c.F. Porsch K.G., Stuttgart- Zuffenhausen (West Germany)) U. S. Pat. 3,678,912. 5p., July 25, 1972. 7 refs. (Appl. April 9, 1970, 17 claims).*

A device for preventing gasoline fuel escape from the mixture formation system of an internal combustion engine to the atmosphere has been designed to be particularly effective and relatively inexpensive as compared to prior art devices of similar nature; it also precludes the need for large changes in the mixture formation system. Combustion air is taken from the atmosphere by way of a suction pipe with an air filter connected to its inlet and is enriched with fuel prior to entry into the combustion spaces. A closure valve is arranged on the inlet side of the air filter and is actuated by an adjusting device adapted to be automatically engaged in dependence on at least one operating condition of the engine. The closure valve is equipped with a snifting or relief valve whose flow cross-section corresponds to the combustion air requirement of the internal combustion engine at partial load so that starting of the engine, for example, by towing, is possible at any time with a closed valve. The device is particularly effective in preventing the evaporation of fuel vapors immediately after stoppage of the engine. (Author abstract modified)

36949 **APTIC NO. 60089**

Hujsak, Karol L. and John W. Palm

METHOD FOR PRODUCTION OF SULFUR FROM HYDROGEN SULFIDE USING OXYGEN. *(Amoco Production Co., Tulsa, Okla.) U. S. Pat. 3,681,024. 3p., Aug. 1, 1972. 6 refs. (Appl. Aug. 10, 1970, 7 claims).*

A method for the recovery of sulfur from hydrogen sulfide-containing gases and, more particularly, for the production of additional elemental sulfur from the effluent stream of a Claus type sulfur recovery plant has been developed to overcome the expenses and stack height problems incurred with the conventional use of incinerators in such processes. The conversion level of the Claus sulfur recovery unit is significantly increased by using oxygen enriched air or substantially pure oxygen to reduce the throughput of inerts, primarily nitrogen. The air which in conventional plant is supplied to the furnace to burn one-third of the hydrogen sulfide is replaced by oxygen of about 95% purity; the total volume of off-gas amounts to only about one-fifth or less of the tail gas from conventional sulfur plants using air. The uncondensed fraction separated from the product sulfur is subjected to a condensing or quenching step where any free sulfur vapors present are removed from the system. The portion of the fraction which remains uncondensed is split into two streams, the larger of which is recycled to the furnace; the smaller one is purged to the atmosphere. (Author abstract modified)

36950 **APTIC NO. 60093**

Kent, Roger E.

GAS SCRUBBER. *(National Dust Collector Corp., Skokie, Ill.) U. S. Pat. 3,680,282. 7p., Aug. 1, 1972. 10 refs. (Appl. May 28, 1970, 11 claims).*

A wet-type gas scrubber employing a layer of foam bubbles through which particulate-contaminated gases pass has been designed to eliminate channeling action in the foam layer associated with prior state-of-the-art scrubber devices. The upper level of the foam layer tends to remain horizontal even though the supporting grid structure and the filter elements may be tilted relative to the horizontal. The depth or thickness of the foam layer is varied over the cross section of the scrubber and is adjusted to be deeper in the particular region where the most severe channeling occurs. The increased thickness of the foam bed helps to redistribute the velocity more uniformly in those regions of the foam layer where the gas velocity is too high.

36951 **APTIC NO. 59219**

Kerr, Clayton P.

SULFUR DIOXIDE REMOVAL IN VENTURI SCRUBBERS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., 33p., 1972 (?). 4 refs.*

Experimental data obtained from demonstration-sized pilot plants, were used to obtain fitted constants for the correlations developed for predicting sulfur dioxide removal from venturi scrubbers. From the correlations, conclusions were drawn regarding the magnitude of the various resistances to mass transfer. The theory of SO2 removal in the scrubbing liquor of the venturi scrubber is described and compared with experimental results. Pilot plant data with strong sodium carbonate solutions as a scrubbing liquor were used to determine the effective length of the scrubber; an effective length of 2.5 in. yielded mass transfer coefficients equal to the calculated coefficients, when there was no solids dissolution resistance or liquid-phase resistance. When liquid-phase diffusion controls, effective lengths were 3 in. Pilot plant data with lime slurries and magnesium oxide slurries fit the equations with the solids dissolution resistance exuded and 2.5 in. as the scrubber length. The expression for the liquid-phase mass transfer coefficient was independent of physical and transport properties, and only experimental data were reactant stoichiometries were approximately one were used. Limestone slurries were only sparingly soluble; and if the liquid compositions remained close to the dilute equilibrium compositions, then the resistance in series model should be adequate for presentation of data. The pilot plant data with limestone slurries was fitted with the solids dissolution resistance included. The constants fitted with 99% confidence limits, the correlation coefficient, and the F levels are summarized. Experimental data and least squares fit is presented based on a venturi length of 2.5 in. The relative magnitudes of various resistances to mass transfer are listed; the more soluble systems, such as magnesium oxide or lime, had less liquid-side resistance than the less soluble limestone system (corrected for solids dissolution).

36952 **APTIC NO. 59782**

Klimisch, Richard L.

CATALYST FOR NITROGEN OXIDE REDUCTION. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,674,423. 2p., July 4, 1972. 8 refs. (Appl. Feb. 9, 1970, 3 claims).*

A catalytic process for the reduction of nitrogen oxides from exhaust gases of an internal combustion engine is described. The gases are passed at elevated temperature into contact with a catalytic composite consisting essentially of alumina with sufficient zinc oxide in an amount up to about 10 mole% effective in reducing the NOx. The composite has the unique ability to reduce NOx not only in a reducing environment, but also in an oxidizing environment. This catalyst is compatible with oxidizing catalysts such as copper oxide and vanadium pentoxide which makes it possible to reduce the amount of both types of exhaust emissions in a single relatively simple catalytic reactor.

36953 **APTIC NO. 60210**

Koch, Christian

METHOD AND DEVICE FOR ABSORBING GASES OR COMPONENTS OF GAS MIXTURES. *(Siemens Akteingesellschaft, Berlin and Munich (West Germany)) U. S. Pat. 3,665,677. 8p., May 30, 1972. 3 refs. (Appl. Nov. 12, 1969, 22 claims).*

A method and apparatus for the liquid absorption of gases or components of gas mixtures has been developed to overcome prior art disadvantages of nonsuitability for absorption from small raw gas quantities and time limitation for solvent usability. The gas or gas mixture and the liquid solvent are introduced from below into at least one column furnished with trays or filter plates formed of a highly porous sintered material such as magnesium aluminum silicate and provided with flow-through openings. Absorption occurs within the liquid and partly within the highly porous plates. The liquid solvent with gas dissolved therein is passed through one or more columns having similar plates for desorption of the gas from the solvent.

36954 **APTIC NO. 60039**

Kubsch, Wilhelm

COLLECTING HOOD FOR COKE-QUENCHING CARS. *(Hartung, Kuhn and Co., Maschinenfabrik GmbH, Dusseldorf (West Germany)) U. S. Pat. 3,675,400. 4p., July 11, 1972. 5 refs. (Appl. April 14, 1970, 8 claims).*

A more effective collecting hood for the suppression of dust and smoke nuisances produced during the discharge of coke batches from horizontal by-product coke ovens into a coke quenching car has been designed to be mounted on a separate track car which moves along with the quenching car for operation from the initial discharge of coke into the car until the car has reached a quenching station. The invention does not require any noteworthy modification of the coke oven arrangement and prevents the escape of dust and smoke during quenching car movement associated with prior art methods. The collecting hood extends over the quenching car in cantilever beam relationship and is at such a height and of such length to cover the entire top of the quenching car.

36955 **APTIC NO. 60094**

Lauer, James L.

APPARATUS FOR REMOVING SULFUR DIOXIDE FROM STACK GASES. *(Assignee not given.) U. S. Pat. 3,676,318. 5p., July 11, 1972. 1 ref. (Appl. Sept 25, 1970, 5 claims).*

An apparatus for the more economic removal of sulfur dioxide from stack gas streams has been developed utilizing electrostatically charged water droplets for improved absorption of the SO2 followed by illumination with ultraviolet light. The ionizing means are located between the spray heads and the gas flow path and consist of alternately spaced discharging and non-discharging electrodes. A direct current in the voltage range of 10,000-20,000 volts is generally preferred. Subjection of the SO2 and H2O to ultraviolet light results in photochemical ionization wherein thy hydrogen ions react with the SO2 to liberate free sulfur in crystalline form. The sulfur can then be separated from the gas by well known methods.

36956 **APTIC NO. 60127**

Leas, Lawrence E., Robert L. Leas, and Cecil J. Johnson

GASIFIER AND DESULFURIZER. *(Leas Bros. Development Corp., Columbia City, Ind.) U. S. Pat. 3,682,591. 4p., Aug. 8, 1972. 3 refs. (Appl. Jan. 12, 1970, 6 claims).*

A continuous method for the gasifying and desulfurizing of char, coke, and coal and for the production of desulfurized superheated carbon dioxide is presented which unlike prior art methods is commercially feasible and profitable. The method generates superheated carbon dioxide which in turn gasifies carbon to carbon monoxide. A higher oxide cobalt is employed to absorb the sulfur gases on the char gasifying cycle; air then regenerates the cobalt. The sulfur gases are removed in a concentrated stream by a novel alcohol absorption sulfur recovery unit. The air reheats the clean coke bed and the top cobalt bed as it is regenerating the sulfur bearing cobalt bed. Excess heat is used to generate steam and electricity. The fly ash is removed as a separate product. Heat exchange circuits are arranged to maximize heat recovery and thermal efficiency, and the process is automated to minimize operating labor costs and to improve safety. (Author abstract modified)

36957 **APTIC NO. 59500**

Lefebvre, Arthur H

CURRENT PROBLEMS AND TRENDS IN GAS TURBINE COMBUSTION. Preprint, 38p., 1972. 61 refs. (Presented at the International Symposium on Air Breathing Engines, 1st, Marseille, France, June 19-23, 1972.)

NTIS: N73-30882

Current problems and trends in gas turbine engine development are reviewed, including the formation and control of exhaust emissions. The airblast atomizer is providing a practical solution to the problem of exhaust smoke, but satisfactory abatement of the other main pollutants calls for a more sophisticated approach to combustion design. Both variable geometry and two-staged systems appear to have considerable potential as low emission combustors, with attendant benefits in terms of superior ignition performance and a wider burning range. Means for minimizing carbon monoxide and unburned hydrocarbon emissions include: improved fuel atomization, primary zone mixture strengths nearer to stoichiometric, increase in primary zone volume, and reduction of film cooling air. Reduction of nitrogen oxide emissions is best achieved by lowering the reaction temperature.

36958 **APTIC NO. 59646**

Leonard, Gerald D.

JACKETED PRECIPITATOR APPARATUS. *(Research-Cottrell, Inc., Bridgewater, N. J.) U. S. Pat. 3,673,768. 4p., July 4, 1972. 10 refs. (Appl. Oct. 17, 1969, 1 claim).*

An improved electrostatic precipitator having a temperature-regulated precipitator chamber for the treatment of particle-laden gases is described. The invention is a hollow-jacketed precipitator gas treatment chamber provided with means for passing a flow of heated gas through the jacket to prevent or reduce the condensation of the gas under treatment onto the interior walls of the chamber. This eliminates the undesirable deposition of gas products and suspended particulate matter on the chamber walls which might build up and reduce precipitator efficiency or cause corrosion. This also prevents undue temperature fall of the precipitator walls.

36959 **APTIC NO. 60105**

McKewen, John L.

METHOD OF AND APPARATUS FOR CHEMICALLY CONDITIONING A PARTICLE-LADEN GAS STREAM. *(Koppers Co., Inc.) U. S. Pat. 3,665,676. 7p., May 30, 1972. 16 refs. (Appl. Nov. 12, 1970, 11 claims).*

An improved and controllable method of conditioning a particle- laden gas stream to improve the collection characteristics for electrostatic precipitation is described. The present method involves the injection of a conditioner solution, preferably ammonium sulfate, into the gas stream before the stream enters an electrostatic precipitator; prior art methods have always involved the injection of chemicals for reaction in situ with other chemicals naturally present in the gas stream. An injection nozzle is connected to a metered means for controlling the amount of solution to be injected into the gas duct going to the precipitator. The method generally controls the electrical resistivity of the particles to within 10 to the 6 to 10 to the 8 power ohm-cm whether or not the particles have a normally low or high resistivity characteristic.

36960 **APTIC NO. 60211**

McLain, Bruce H., John P. Sallee, and Shirley B. Ashton

ELECTROSTATIC AIR CLEANER. *(Air Control Industries, Inc.) U. S. Pat. 3,665,679. 8p., May 30, 1972. 13 refs. (Appl. Jan. 28, 1970, 3 claims).*

An electrostatic air cleaning precipitator has been designed such that unlike prior art devices the opposed supporting walls for the collector plates include recesses or grooves for support of the collector plate edges as well as the electrical conductors and ionizer electrodes. Elongated transverse recesses are formed in at least one of the supporting walls for receiving the charging and grounding conductors. Alternately offset plate recesses are formed in the supporting walls between the conductor recesses for receiving the collector plates parallel to each other. The plates are also staggered front to rear so that the front edges of one set will electrically contact one conductor while the opposite edges of the other will electrically contact the other conductor. (Author summary modified)

36961 **APTIC NO. 60128**

Meade, Reginald E.

DUST COLLECTING PROCESS. *(Pillsbury Co., Minneapolis, Minn.) U. S. Pat. 3,675,393. 8p., July 11, 1972. 9 refs. (Appl. Feb. 20, 1970, 11 claims).*

A dust collecting device utilizing a foraminous collecting screen for collection of dust in a relatively loosely arranged mat of particles adhesively bonded together has been developed to overcome prior art difficulties associated with undesirable back pressure across the filter screen after short periods of operation. Droplets of liquid are introduced to a moving stream of dust-containing gas to prompt the cohering of particles in three different ways: by the wetting of the surfaces, dissolving of potentially tacky solubles, and deposition of an adhesive contained in the droplets of liquid. The air stream is forced through a porous collecting element such as a woven metal screen while the particles are in a tacky coherent condition. A mat of dust particles which forms on the surface of the collecting member is maintained in a highly porous condition and acts as the filter medium; it is self-supporting, often friable, and offers much less resistance to gas flow than the same dust particles in an unbonded condition. (Author abstract modified)

36962 **APTIC NO. 60092**

Miller, Raymond S.

CLEAN COMBUSTION ENGINE SYSTEM. *(Assignee not given.) U. S. Pat. 3,680,305. 9p., Aug. 1, 1972. 7 refs. (Appl. Sept. 28, 1970, 6 claims).*

A clean combustion engine system embodying a two-cycle internal combustion engine has been developed to reduce carbon monoxide and hydrocarbon emissions without an attendent increase in oxides of nitrogen, a problem associated with present methods of control involving high compression ratios and high operating temperatures. The engine is supplied near the end of each power stroke with an initial charge of pure air for purifying and cooling the engine cylinder and a subsequent fuel-air charge which enters the cylinder in a manner that achieves efficient combustion during the next power stroke. Air is supplied to the engine through a large plenum chamber from a compressor powered by the engine. Fuel flow to the engine is regulated by a carburetor throttle valve and timing valve which opens and closes in timed relation to the reciprocating motion of the engine piston. Air flow to the engine is regulated by an air valve operated by a governor in response to both throttle valve setting and engine speed. (Author abstract modified)

36963 **APTIC NO. 59583**

Nakajima, Yasuo, Yoshimasa Hayashi, and Kunihiko Sugihara

AIR-POLLUTION PREVENTIVE SYSTEM FOR MOTOR VEHICLES. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,673,993. 9p., July 4, 1972. 9 refs. (Appl. Jan. 19, 1970, 4 claims).*

An air pollution preventive system for use with an internal combustion engine of motor vehicles is described. The system is adapted to reduce the concentration of nitrogen oxides in the exhaust gases emitted from the engine during city driving. The exhaust gases are recirculated from the exhaust manifold into the intake manifold and cooled only when the vacuum in the intake manifold is lower than a predetermined level and concurrently the engine is driven at a speed within a predetermined range. The predetermined level and range are determined as corresponding to the vehicle speed at which the motor vehicle is accelerated or climbs up a hill as frequently experienced during city driving. (Author abstract modified)

36964 **APTIC NO. 60086**

Nakajima, Yasuo and Yoshimasa Hayashi

AIR-POLLUTION PREVENTIVE SYSTEM FOR MOTOR VEHICLES. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,675,633. 6p., July 11, 1972. 7 refs. (Appl. Jan. 13, 1970, 3 claims).*

A system for reducing the concentration of nitrogen oxides in internal combustion engine exhaust has been designed to overcome engine operation instability problems associated with systems using continuous recirculation for NOx reduction. Exhaust gases are recirculated into the intake manifold only when the engine is driven under predetermined conditions represented by the level of the vacuum in the intake manifold and the angular position of the throttle valve of the carburetor. Recirculation occurs when the vehicle is either accelerating or climbing a hill. The recirculation device consists of valve-controlled recirculating passage and a double-action cam which is both axially movable in response to intake manifold vacuum conditions and angularly displaced in response to movement of the throttle valve to open the valve.

36965 **APTIC NO. 60091**

Nakajima, Yasuo, Yoshimasa Hayashi, Toru Yoshimura, Kunihiko Sugihara, and Shin-ichi Nagumo

CENTRALIZED AIR-POLLUTION PREVENTIVE SYSTEM. *(Assignee not given.) U. S. Pat. 3,680,318. 11p., Aug. 1, 1972. 10 refs. (Appl. Dec. 22, 1970, 19 claims).*

A centralized control system for coordinating several automotive emission control devices is presented. The system includes an ignition timing retarding device, an exhaust gas afterburner, an exhaust gas recirculation device, a fuel vapor trapping device, an atmospheric air introducer, and a device for reducing hydrocarbon exhaust during deceleration. The system also includes the following sensors: a vehicle speed sensor, an intake manifold vacuum sensor, a throttle opening sensor, an engine temperature sensor, and an exhaust temperature sensor. A controller is adapted to determine the individual predetermined conditions of engine operation during which the air pollution preventive devices are placed in operation in accordance with electric signals supplied to it from the sensors. (Author abstract modified)

36966 **APTIC NO. 60043**

Price, Franklin Carr

METHOD AND APPARATUS FOR SCRUBBING GASES. *(Assignee not given.) U. S. Pat. 3,676,982. 5p., July 18, 1972. 3 refs. (Appl. Aug. 14, 1970, 8 claims).*

A highly efficient scrubber for the removal of gaseous and particulate matter from a wide variety of stack gas streams has been developed to achieve greater efficiency and to reduce attendant maintenance problems normally associated with such devices. The gas to be cleaned is discharged into a body of liquid and forced beneath a flat distributor plate located well within the liquid. The gas volumetric radial flow rate and liquid head cause a thin, high velocity gas stream to be developed giving a high scrubbing and reaction efficiency. The liquid level is maintained by a pair of overflow headers, and the liquid is normally added continuously to the scrubber tank in the form of gas cooling sprays. (Author abstract modified)

36967 **APTIC NO. 60002**

Puiu, M.

CURRENT TRENDS IN THE CONTROL OF SULFUR-CONTAINING VOLATILE COMPOUNDS IN SULFATE PULP PLANTS. *(Tendinte actuale in combaterea pier-*

derilor compusilor volatili ai sulfului in fabricile de celuloza sulfat). Text in Romanian. Celul. Hirtie (Bucharest), 21(10):523-533, 1972. 10 refs.

The stages of the technological process of cellulose production during which sulfur-containing compounds are generated are analyzed, and the current methods for control of these volatile pollutants are discussed. Recent studies conducted at Suceava indicated that the loss of S-containing volatile compounds reaches 12 to 13 kg of sodium sulfate/ton of cellulose. Utilization of S in pulp production produces pulp of superior quality and therefore the sulfate method is the most popular known. Its application, however, poses pollution problems, due especially to the highly unpleasant smell of the gases emitted to the atmosphere around the pulp plants. The methods suggested for the reduction of the volatile S compounds emitted are oxidation of the sulfate, combustion of the volatile sulfate compounds, and adsorption of these compounds. The gases are captured and transferred to the oxidation, combustion, or adsorption installations. After being burned in a combustion boiler, they are sent through electrostatic filters and purified with alkaline solutions.

36968 **APTIC NO. 60107**

Rose, Ronald N.

ELECTROSTATIC PRECIPITATOR CELL FOR DESK OR TABLETOP AIR PURIFIER. *(Assignee not given.) U. S. Pat. 3,678,655. 4p., July 25, 1972. 7 refs. (Appl. June 3, 1969, 6 claims).*

An indoor, desk or tabletop electrostatic precipitator air purifier for domestic use has been designed differently from prior art units of its kind in that it utilizes a unitary precipitator cell in which the ionizing chamber and collecting plates are all part of one integral unit which can be easily removed and inserted for cleaning or maintenance. The precipitator cell is located and constructed such that all of the air drawn into the air cleaner housing passes through the cell chamber to ensure that all the air proceeds through the ionizing chamber and past the collecting plates. (Author summary modified)

36969 **APTIC NO. 59584**

Sawada, Hiraki

AIR-POLLUTION PREVENTING SYSTEM. *(Nissan Motor Co., Ltd., Yokohama (Japan)) U. S. Pat. 3,673,997. 5p., July 4, 1972. 4 refs. (Appl. Feb. 8, 1971, 4 claims).*

An air pollution preventive system for an internal combustion engine of a motor vehicle is described. Unlike other systems, it eliminates the evaporative gases emitted from the fuel storage tank into the atmosphere which reduces air pollution. The evaporative gases produced in the fuel storage tank are introduced to the crankcase of the engine and admitted to the combustion chamber of the engine through the carburetor of the engine together with the blowby gases in the crankcase. The flow of the evaporative losses in the crankcase is controlled by a valve adapted to be responsive to pulsations in the pressure in the crankcase of the engine. (Author abstract modified)

36970 **APTIC NO. 59268**

Shaw, Henry

FUEL MODIFICATION FOR ABATEMENT OF AIRCRAFT TURBINE ENGINE OXIDE OF NITROGEN EMISSIONS. FINAL REPORT. *Esso Research and Engineering Co., Linden, N. J., Government Research Lab., Air Force Aero Propulsion Laboratory Contract F33615-71-C-1575, Proj. 306605, AFAPL-TR-72-80, Esso Rept. GRU.1GDJA.72, 72-2687, 122p., Oct. 1972. 33 refs.*

NTIS, DDC: AD-752 581

A broad experimental program was undertaken to assess the feasibility of reducing nitrogen oxides from aircraft gas turbine engines by fuel modification. The Esso High Pressure Cannular Combustor was used to simulate the characteristic emissions of gas turbines at full power operation. Over 70 fuel modifications were tested using Jet A as the base fuel. Soluble compounds of cobalt, iron, magnesium, and copper reduce NOx by as much as 30% when added to the fuel at a treat rate of up to 0.5% (w). Compounds of sodium reduce NOx by as much as 26% when added as suspensions or in aqueous emulsions. An aqueous emulsion containing 37 ppm (w) hydrazine acetate reduces NOx by 15%, but this modification was not consistently effective. None of the investigated additives were fully acceptable because of the relatively low NOx reduction that was obtained even with high additive treat rates. A simple expression was derived which is useful in estimating nitric oxide levels in gas turbine combustors when equilibrium NOx concentrations and temperature are known. (Author abstract)

36971 **APTIC NO. 59561**

Stambaugh, R. L., R. J. Kopko, and T. M. Franklin

EFFECT OF UNLEADED FUEL AND EXHAUST GAS RECIRCULATION ON SLUDGE AND VARNISH FORMATION. *Preprint, Society of Automotive Engineers, New York, 16p., 1972. 14 refs. (Presented at the Society of Automotive Engineers, National Fuels and Lubricants Meeting, Tulsa, Okla., Oct. 31-Nov. 2, 1972.)*

Based on evaluations in a Sequence V-C type procedure, unleaded fuel led to slightly milder sludge ratings but more severe varnish ratings than conventional leaded fuel; when exhaust gas recirculation (EGR) was used with unleaded fuel, sludge and varnish ratings were not greatly different from those when unleaded fuel was used without engine modification; 0.5 g leaded fuel gave about the same sludge and varnish severity as unleaded fuel when EGR was used; and formulations containing dispersant viscosity index (V.I.) improvers of the methacrylate/N-vinylpyrrolidone type provided varnish protection superior to that with formulations based on ashless dispersant and nondispersant V.I. improver (using unleaded or 0.5 g leaded gasoline with or without EGR). Used oil data when conventional leaded gasoline was used indicate that about half of the sludge from a modified V-C test is composed of lead compounds. However, when lead was eliminated from gasoline, the contributions of organic compounds to sludge approximately doubled, so that the total amount of sludge remained nearly the same. Based on a modified Sequence V-C evaluation and sludge analysis, there appears little reason to expect oil drain intervals to increase significantly when unleaded gasoline and EGR are used. (Author summary)

36972 **APTIC NO. 60072**

Sterrett, Eugene L.

GAS SEPARATING DEVICE. *(Assignee not given.) U. S. Pat. 3,675,394. 7p., July 11, 1972. 1 ref. (Appl. June 16, 1970, 17 claims).*

An improved filter structure for the separation of one or more gases from a gas stream has been designed to produce less pressure drop than prior art devices of similar function. The device consists of a honeycomb type structure which contains a large number of compartments through which air passes from intake to exhaust. The individual compartments contain granular material adapted to adsorb or react with a gas flowing therethrough but are only partially filled by the material. Hence, spaces are left in the compartments to allow for the relatively unrestricted flow of air. The granular material is retained in the compartments by screening disposed across opposite ends of the compartments. (Author summary modified)

36973 **APTIC NO. 60060**

Stevens, William D.

MINIMIZATION OF NITROGEN OXIDES IN COMBUSTION PRODUCTS. *(Foster Wheeler Corp., Livingston, N. J.) U. S. Pat. 3,675,629. 4p., July 11, 1972. 4 refs. (Appl. Sept. 28, 1970, 8 claims).*

A furnace design for the minimization of nitrogen oxide occurrence in combustion products, a problem associated with prior art high temperature designs, is presented. Fuel is burned in several rows of burners to heat a fluid which is made to pass in rows of tubes between the rows of burners for lowering of the temperature of gases in the vicinity of the burner flames. Hence, the time that the gases are held at high temperatures is reduced, resulting in a decrease in NOx concentration. (Author summary modified)

36974 **APTIC NO. 60038**

Tatsutomi, Yasuo and Tetsuo Noma

DEVICE FOR CONTAINING AND SUBSEQUENTLY CONSUMING THE FUEL VAPORS ESCAPING TO THE ATMOSPHERE FOR AN INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima (Japan)) U. S. Pat. 3,675,634. 3p., July 11, 1972. 3 refs. (Appl. Sept. 24, 1970, 3 claims).*

A device for containing and subsequently consuming fuel vapors escaping from the fuel tank or carburetor of an automobile equipped with an internal combustion engine has been developed to overcome the short life span of activated carbon and complexity of connecting components associated with similar type devices. A vapor tube running from a condensate tank coupled to the gas tank is connected to a tube which in turn connects the crankcase to the inlet manifold. A valve disposed in the connection tube opens only during engine operation to prevent fuel vapor from escaping to the atmosphere. A canister for absorbing fuel vapor is connected between the crankcase and air cleaner, and the fuel vapor absorbed by the canister while the engine is stopped is exhausted and replaced by clean air from the air cleaner when the engine is operating.

36975 **APTIC NO. 60087**

Tatsutomi, Yasuo

EXHAUST GAS RECYCLE SYSTEM FOR A ROTARY PISTON INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Akicun, Hiroshima-ken (Japan)) U. S. Pat. 3,682,151. 4p., Aug. 8, 1972. 9 refs. (Appl. Nov 9, 1970, 1 claim).*

An exhaust gas recycle system for reducing nitrogen oxides emitted from a rotary piston internal combustion engine has been developed to readily cool the exhaust passing through the conduit, thereby avoiding heat-induced engine deterioration problems associated with prior state of the art devices of a similar nature. The recycle conduit is situated near the engine coolant jacket within the engine casing; and, since the intake and exhaust passages are disposed on the same side of the engine, cooling of the control valve which responds to the operational states of the engine is easily accomplished.

36976 **APTIC NO. 60138**

Vitenko, Andrew H.

SMOKE CLEANING APPARATUS. *(Assignee not given.) U. S. Pat. 3,665,681. 6p., May 30, 1972. 7 refs. (Appl. Oct. 13, 1970, 4 claims).*

A smoke cleaning apparatus for the removal of particulate and gaseous components emitted by smoke generators such as incinerators has been developed utilizing a combination of filtering and absorption by water sprays. Particulates are cleaned by a filtering mass centrally mounted within the apparatus through which the smoke is drawn by a suction fan underneath. Annular smoke conduits are provided about the periphery of the filtering mass to provide added filtering surfaces for the passing smoke. Gases not subjected to the filtering procedure are absorbed by water sprayed or injected into the conduit which removes the product of combustion from the apparatus casing. A sump is provided for collecting the water used by the spray device.

36977 **APTIC NO. 59238**

Volsy, Robert

TWO NEW APPARATUSES FOR THE ELECTROSTATIC PRECIPITATION OF AEROSOLS: 1. BY GLOBAL SAMPLING. 2. BY GRANULOMETRIC SEPARATION. *(Deux nouveaux appareils de precipitation electrostatique d aerosol 1. a prelevement global 2. a separation granulometrique). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. 3 refs. (May 3-5.)*

Two new apparatuses for the electrostatic precipitation of aerosols, one operating by global sampling without fractionation and another for granulometric separation, are described. Both apparatuses are required to collect at least 10 mg of dust during not more than 24 hr of autonomous operation. The global sampling precipitator is composed of a parallelepipedic chamber in which a point electrode in the form of a longitudinal filament is inserted. The dust is captured uniquely on the plane electrode around the point electrode, and turbulence is prevented by supporting the electric wind with air. The other precipitator, designed for granulometric separation, is composed of an ionizing chamber similar to the first apparatus in which, however, there is no precipitation, and another precipitation chamber similar to an Erikson ion spectrometer, in which the charged aerosol is injected through a nozzle in the form of a thin blade whose thickness is small relative to the electrode gap, and which jet is stabilized by air.

36978 **APTIC NO. 60084**

Wada, Shozo

METHOD AND APPARATUS FOR SOOT CONTROLLING IN A THERMAL DECOMPOSITION OF A HYDROCARBON GAS. *(Tokyo Heat Treating Co., Yokohama (Japan)) U. S. Pat. 3,682,605. 13p., Aug. 8, 1972. 5 refs. (Appl. July 15, 1969, 10 claims).*

A method for controlling the heretofore difficult problem of soot formation resulting from thermal decomposition of a hydrocarbon gas through a high temperature oxidation reaction has been designed for endothermic gas generators of the type used for the manufacture of town gas. The feed mixture of hydrocarbon gas and air is introduced rapidly and adiabatically into a catalyst-filled retort maintained at a temperature of 1000-1100 C. Heat is provided from the outside through a perforated heat insulating block having a thickness sufficient to attain proper insulation. The hydrocarbon gas is thermally decomposed in the catalyst layer. The heat-insulating block consists of heat- insulating brick and a refractory brick and is placed directly upon the catalyst. Operation of the generator can be carried out in a stable manner for a prolonged period of time with a constant generated gas composition. (Author abstract modified)

36979 **APTIC NO. 59231**

Walkenhorst, W.

STUDIES CONCERNING THE IMPROVEMENT OF THE SEPARATING EFFICIENCY OF DUST FILTERS BY INCREASED ADHESION. *(Untersuchungen zur Verbesserung des Abscheidegrades von Staubfiltern durch Erhoehung der Haftkraft). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. 5 refs. (May 3-5.)*

Experiments concerning the improvement of dust separating efficiency for dust filters by increasing the adhesion of the dust particles to the filter surface by the application of potential and/or atomized olive oil, paraffin oil, or glycerine in the air flow are described. The experiments were performed with coal dust smaller than 15 micron, on iron wire netting with 0.53-1.8 mm mesh and wires thicknesses of 0.2-0.35 mm. The wires were coated with plastic material, and plastic fiber netting of identical mesh was interposed between two iron nettings. The additives were added at an expenditure smaller than 5 mg/cu m, and they were retained nearly quantitatively, the concentrations after the filter being less than 1 mg/cu m. The separation efficiency had its maximum at a flow rate of 180 cm/sec when neither potential nor additives were applied. With potential but without additive, the efficiency was higher than that measured without potential up to a flow rate of 4 m/sec, while the use of additives, especially of olive oil, either with or without potential applied, resulted in very strong increase in the separation efficiency and values exceeding 85% were achieved even at flow rates as high as 10 m/sec.

36980 **APTIC NO. 60125**

Wellan, Wayne G., John O. Converse, and Arden E. Swanson

MODULAR BAG-TYPE FILTER FOR GASES. *(Hart-Carter Co., Minneapolis, Minn.) U. S. Pat. 3,680,285. 10p., Aug. 1, 1972. 2 refs. (Appl. Nov. 23, 1970, 16 claims).*

A modular bag-type dust filter for cleaning particulate laden gas streams has been designed with more efficient dust filter construction involving substantially no mechanical moving parts; the filter bags can be readily removed and replaced from the interior of the filter housing without the need of special tools of structural dismantling operations and without disturbing the various air flow connections or filter-flushing apparatus. Several tubular filter bags are arranged in several parallel rows and suspended from a tube sheet separating a dusty air section from a clean air section. The filter bags in the dusty air section have their upper ends opening into the clean air section through apertures in the tube sheet. A reverse flow filter bag flushing system is provided in which a flushing air conduit for each row of filter bags extends into the clean air section directly above and parallel with the respective row of filter bags and has a series of individual spouts each directed into a flow nozzle extending into the open end of a respective filter bag. The several conduits have their outer ends extending into a common valve chest which has direct connection with a reservoir of compressed air and which includes individual pilot-controlled, pressure-actuated diaphragms contoured to engage and normally close the outer end of a respective flushing air conduit. The diaphragms are operated sequentially. (Author abstract modified)

36981 **APTIC NO. 59469**

Humble Oil and Refining Co., Corporate Planning Dept.

NATURAL GAS AND LPG POWERED VEHICLES. (FINAL REPORT). *26p., Feb. 1972.*

The potential impact of using natural gas and liquefied petroleum gas as vehicular fuels has been assessed in terms of the potential extent of penetration, corresponding supply and demand implications, and the possible effects on pollutant emissions. Hydrocarbon, carbon monoxide, and nitrogen oxide pollutant emissions from motor vehicles appear reducible in the near term by a maximum of about 10% with the substitution of natural gas for gasoline in fleet vehicles in urban areas. The emission reduction incentives, however, will be temporary because modified gasoline engine operation is anticipated to reach natural gas emission levels by 1975-76. The limited supply of natural gas will require its replacement by alternative fuels in the industrial sector and will thus result in increases in sulfur oxide, particulate matter, and nitrogen oxide emissions in this sector, thereby partially offsetting the emission reductions achieved in the transportation sector.

36982 **APTIC NO. 59907**

Ministry of Labor, Health, and Welfare of North Rhine-Westphalia (West Germany)

WOOD PROCESSING INDUSTRY. *(Holzinudstrie). Text in German. In: Reine Luft fuer morgen. Utopie odor Wirklichkeit? Ein Konzept fuer das Nordrhein-Westfalen bis 1980. p. 51-52, 1972.*

The state of the art and the expected evolution of the dust emissions from the wood processing industry, especially furniture and particle board manufacturing plants, in North Rhine-WestPhalia are outlined. Dust and fine chips generated in furniture and particle board manufacturing plants are usually sucked off pneumatically. Cyclones are used for the separation of relatively coarse chips, while finer material is separated by means of tissue filters that are efficient for a minimum particle size of 0.5 micron. Without further measures for emission abatement, the dust emissions from the wood processing industry would double from 1970 until 1980 from about 2000 tons to 4000 tons yearly. The envisaged introduction of emission-free material handling and conveying equipment, of high-efficiency cyclones and dust filters is, however, expected to decrease the dust emission by about 50% to some 1500 tons.

36983 **APTIC NO. 60306**

Olson Labs., Inc., Anaheim, Calif.

ANALYSIS OF EFFECTIVENESS AND COSTS OF RETROFIT EMISSION CONTROL SYSTEMS FOR USED MOTOR VEHICLES: VOLUME III-PERFORMANCE ANALYSIS. *Office of Air Programs Contract 68-04-0038, APTD-1337, Rept. 71Y223, 157p., May 1972. 16 refs.*

The performance analysis of effectiveness and costs of retrofit emission control systems for used motor vehicles is documented. The air bleed systems provided effective control of carbon monoxide and, to a lesser extent, hydrocarbons. The initial cost ranged from about $23 to $64. The systems tested to evaluate the effectiveness of ignition timing modification and exhaust gas recirculation were effective in reducing nitrogen oxides. These systems were combined with lean idle mixture and vacuum advance disconnect, respectively, and indicated some reduction of CO and hydrocarbons as well. Their initial costs were estimated as $45 and $89 respectively. The timing modification system indicated increased recurring costs due to higher fuel consumption, the exhaust gas recirculation system indicated that fuel consumption could be less with the device installed. A catalyst system was tested to control CO and HC and indicates the highest overall emission reduction effectiveness because it incorporated vacuum advance disconnect to control NOx. The initial cost is approximately $175 and includes an air pump.

36984 **APTIC NO. 60345**

Olson Labs., Inc., Anaheim, Calif.

ANALYSIS OF EFFECTIVENESS AND COSTS OF RETROFIT EMISSION CONTROL SYSTEMS FOR USED MOTOR VEHICLES. VOLUME VI: ADDENDUM FOR DURABILITY TEST. *Office of Air Programs Contract 68-04-0038, Rept. 71Y233, APTD-1340, 43p., May 1972.*

Data on five uncontrolled vehicles retrofitted with exhaust emission control devices are presented to show the effect of mileage accumulation on exhaust emission reduction, driveability and safety, maintenance and inspection requirements, and device and vehicle reliability. The four devices tested were an air bleed to-intake manifold, a catalytic converter with distributor vacuum advance disconnect, an ignition timing modification with lead idle mixture adjustment, and speed-controlled exhaust gas recirculation with distributor vacuum advance disconnect. The tests ran over a 25,000-mile interval. Vehicles should receive an emission inspection with appropriate hydrocarbon, carbon monoxide, and nitrogen oxides instrumentation at the time of retrofit installation and periodically thereafter; no device oriented safety problems were observed; appropriate inspection instrumentation, procedures, and frequency of inspection should be determined for the particular retrofit devices; auxiliary retrofit device components can be failure prone with mileage accumulation; and retrofit devices on used vehicles with high oil consumption or other abnormal mechanical conditions are not recommended. (Author conclusions modified)

1971

36985 **APTIC NO. 59555**

Cornelius, Walter, Donald L. Stivender, and Robert E. Sullivan

A COMBUSTION SYSTEM FOR A VEHICULAR REGENERATIVE GAS TURBINE FEATURING LOW AIR POLLUTANT EMISSIONS. *In: Vehicle Emissions, Part III, Papers From 1967-70. Society of Automotive Engineers, Inc., New York, Rept. 670936, p. 599-618, 1971. 17 refs.*

The combustion system developed for the General Motors GT-309 regenerative gas turbine was used to illustrate pertinent structural, performance, and exhaust emission considerations when designing for a vehicular gas turbine application. The development of each major component and the performance of the combustion system as a whole are reviewed. The satisfactory performance and durability potential of the GT-309 engine combustion system were demonstrated by extensive operation in a component test facility and in several test cell and vehicle installed engines. Exhaust emissions of unburned hydrocarbons and carbon monoxide were minimal and were of no concern from an air pollution standpoint. No objectionable exhaust smoke or odor were produced. As is the case with current spark ignition and compression ignition engines, the emissions of nitrogen oxide in the present state of development did not satisfy the proposed 1970 California limit for this air pollutant on an equivalent weight flow basis. The photochemical reactivity of the turbine exhausts, the effects of varying operating variables (turbine speed, fuel-air ratio, inlet temperature, and nozzle differential air pressure) on engine exhausts, and combustion system design and structural considerations are also discussed. (Author abstract modified)

36986 **APTIC NO. 60312**

Deen, J. L. and R. J. Schoeppel

HYDROGEN AND THE ELECTRIC ECONOMY. *Preprint, Oklahoma State Univ., Stillwater, 10p., Sept. 28, 1971. 12 refs. (Presented at the Frontiers of Power Technology Conference, Proceedings, Annual Meeting, 4th, Stillwater, Okla., Sept. 30-Oct. 1, 1971.)*

The increased demand for energy has led to an increased demand for electricity, a secondary form of energy. The rate of growth of electricity demand is expected to continue until a near-total electric economy is achieved. The transition to the electric economy is expected to involve the electric auto in a number of ways: electrically generated hydrogen for use in internal combustion engines; stored electricity in the form of batteries for use in providing vehicle propulsion; and electrical generated hydrogen for use in fuel cell engines. These energy conversions are predicted to occur in this order. Various ramifications of such evolutionary changes, including the influences of the energy crisis and environmental degradation, are presented. (Author abstract modified)

36987 **APTIC NO. 59944**

Devos, A.

INFLUENCE OF REPEATED DISINFECTION ON AIR POLLUTION IN POULTRY HOUSES AND ON CRAMMING CHICKEN PRODUCTION. *(Influence de la desinfection repetee sur la pollution atmospherique des poulaillers et sur la production de poussins a l engraissement). Text in French. Rec. Med. Vet., vol. 147:1335-1347, Dec. 1971. 26 refs.*

The effect of disinfectant spraying, repeated 2 to 6 times, on the microbial infection in hatcheries was studied. The disinfectants used were Environ (o-phenylphenol with o-benzyl-p-chlorophenol and tertiary amylphenol); Tego 51 (dodecyl-di(amino-ethyl)glycine); and Tego and Wescodyne (iodophor). The air samples were taken by means of Casella bacteria air sampler. The aerobic flora, cultured on gelose tryptone, rose from an initially low in-the-air concentration to the highest possible level in about 5 weeks, regardless of the type of the disinfectant used. A combination of Tego 51 and Tego 103, as well as Environ were highly effective in the control of fungi, cultured on Sabouraud substrate, while Tego 51 alone, and a combination of Wesodyne with Environ and Tego 103 had a short-term effect. All preparations were effective against Enterobacteriaceae, studied in McConkey gelose. All preparations were effective also against micrococcus during the first 5 weeks.

36988 **APTIC NO. 59518**

Elyashevich, M. G.

PREDICTING THE RESULTS OF COAL FLOTATION. *Coke Chem. (English translation from Russian of: Koks i Khim.), no. 4:8-10, 1971. 1 ref.*

Coal flotation consists of encounters between mineral particles and air bubbles in the pulp, bonding between the particles and bubbles, and removal of particles from the froth into the concentrate. This process is analyzed theoretically to determine the concentrate yield and ash correlation, the probabilities of the successive stages, and the effect of other factors such as coal size on flotation results. Regression equations were also derived between the ash of the concentrate and the ash of the incoming product. The validity of the equations for predicting the yield and ash of the concentrate was checked on a computer and was good. Thus, regression equations can be used to predict the yield and ash of the concentrate, provided the rank and ash of the incoming coal are known. The scientific information derived in this way was used to draw up a flotability classification chart for Donbas coals.

36989 **APTIC NO. 59502**

Hurkamp, C. H., W. M. Johnston, and J. H. Wilson

TECHNOLOGY ASSESSMENT OF ADVANCED GENERAL AVIATION AIRCRAFT. *Lockheed-Georgia Co., Marietta, Ga., Advanced Concepts Dept., National Aeronautics and Space Administration Contract NAS2-5972, Rept. CR-114339, 379p., June 1971. 159 refs.*

NTIS: N71-35210

An assessment of the potential impact of advanced technology in 1985 on four classes of general aviation aircraft is presented along with recommendations in areas were further research and development will help to realize the potential improvements. Oxides of nitrogen, probably created in the high temperature flamefront, will require additional research for achievement of tolerable levels, although fuel injection and dual ignition are both proving helpful at present. Carbon monoxide and hydrocarbons are and will be a lesser problem since the manner of aircraft operation assures an optimum fuel/air ratio most of the time. The smoke trail from turbo engines can be eliminated by proper design of the combustion chamber. Exhaust gas emission control will significantly reduce the emission of all major contaminants to an acceptable level.

36990 **APTIC NO. 59474**

Jugel, W. and J. Lotze

STATE OF THE ART OF DUST SEPARATION BY MEANS OF TISSUE FILTERS. *(Stand der Technik auf dem Gebiete der Staubabscheidung mittels Geweben). Text in German. Luft- Kaeltetech., no. 4:181-186, 1971. 28 refs.*

State of the art are current trends in the area of dust separation by means of tissue filters are presented. Inertia and diffusion forces are chiefly responsible for the dust separation by tissue filters. The inertia increases with increasing particle mass and increasing flow rate, while diffusion effects are essential for dust separation only below a given particle size and below a definite flow rate. Tissue filters may reach efficiencies up to 99.9%, and combinations of tissue filters with cyclones, especially for high dust concentrations, are highly effective. Increase of the operating temperatures by the use of new, especially synthetic fibers, such as glass, nomex, and teflon fibers, the development of chemical-proof, high-strength fibers, reduction of the energy costs by the adoption of the module principle, reduction of the maintenance by the use of individual drive for the individual filter cells, and increase of the fiber strength by texturization are among the basic trends in the development of tissue filters and filter tissues.

36991 **APTIC NO. 59486**

Potter, G. M.

RECOVERY OF NONFERROUS AND PRECIOUS METALS FROM ELECTRICAL AND ELECTRONIC SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, and Bureau of Mines, Washington, D. C., Eff. Technol. Res. Scrap Met. Recycling, Proc. Workshop, Washington, D. C., 1971, p. 32-34. (Jan. 7.)*

Leaching of selected scrap with cyanide solutions, proprietary compounds, or acids may be very effective. However, such methods are not satisfactory for very complex scrap, even after incineration. The complex metal assortments contain natural precipitants for gold and silver. Strong acids are not selective enough or cheap enough for low-grade scrap. Smelting of complex scrap requires preliminary incineration to burn off plastics and other organics. Experiments with a pilot-size incinerator showed that fumes and precious metal losses can be reduced to negligible amounts by afterburning and wet scrubbing. Low aluminum scrap can be smelted to give an impure metal and a slag that can be sampled, assayed, and sold to a custom smelter for further processing. Alternatively, the metal can be drossed to remove iron, aluminum, and other impurities to give a copper-base bullion for wet electrolytic refining to recover copper and precious metals. High aluminum scrap is highly troublesome to smelt, as the slags are viscous and unmanageable. The extensive use of hand labor to remove aluminum from low-grade scrap is prohibitively expensive. Aluminum can be reached from scrap with caustic solution, consuming about 500 lb/ton, if the aluminate solution is hydrolyzed to regenerate the caustic. Aluminum can be sweated from scrap, but dissolves precious and other metals. However, promising work has been done on fused salt electrolysis purification of the sweated aluminum. If this approach is successful, it might well be the best method of handling high aluminum scrap. The sweated residue and electrolytic cell copper precious metal product would be smelted to copper-base bullion for wet electrolysis.

36992 **APTIC NO. 59260**

Starkman, Ernest S.

THE CHANCES FOR A CLEAN CAR. *Astronaut. Aeronaut., 9(8):68-75, Aug. 1971. 24 refs.*

A need exists to control emissions to levels presently legislated for 1975 model vehicles. Returning the atmosphere to acceptable quality and maintaining it until the year 2000 will require reducing vehicle exhaust emissions. Laboratory vehicles with gasoline reciprocating engines have demonstrated the possibility of reducing exhaust content of pollutants almost to levels prescribed for 1975. Steam, gas turbine, and Stirling-cycle engines have yielded emissions levels which are in some cases below the near-term requirements. However, they have yet to demonstrate that they will match equally clean gasoline piston engines in cost, operating economy, flexibility, and acceptability. In spark-ignition engines, natural gas and propane have yielded less-reactive hydrocarbons and carbon monoxide than gasoline. However, natural gas limits vehicle range and power. Requiring low vehicle emissions than those projected for 1975 or those demonstrated attainable in the laboratory with controlled conventional vehicles cannot be justified without also considering the relative contribution of pollutants from other sources. (Author conclusions)

36993 **APTIC NO. 60154**

Svanda, Josef and Emanuel Konrad

USE OF THE DUST RESIDUE FROM CEMENT ROTARY KILNS FOR IMPROVEMENT OF SOIL STRENGTH. *(Vyuziti odprasku z cementarskych rotacnich peci pro zlepseni unosnosti zemin). Text in Czech. Stavivo, 49(11):13-16, 1971. 7 refs.*

The effect of dust residues from the production of clinker in cement works amounting to from 3 to 10% of clinker production on characteristics of different soils used in embankments and as highway subgrade were tested. The dust containing roughly 40-60% CaO acts as a binder of soil particles in the form of a hydrate of dicalcium silicate. The long-term process between the dust and the soil lasting for weeks and months yields the best results at pH 12.4; below 7 C the process is arrested. The bearing capacity of soils to which the clinker dust has been added in amounts from 4 to 10% met requirements of the Czechoslovakian standard 736183 for soils used in engineering construction. The effect is considerably less beneficial in the case of sandy soils. Stabilization of soils according to the standard is met when the compression strength is 12 to 20 kp/sq cm, and when the loss of mass does not exceed 5% after 12 dippings in water and 10% following exposure to freezing temperatures for 12 consecutive times. Losses require the addition of 4% clinker dust, and the addition of 7% clay dust if the above conditions are to be met. In many instances results were better than when equivalent amounts of lime were added to the soils

1970

36994 **APTIC NO. 59912**

Coster, J.-P. de

AIR POLLUTION BY VEHICLE ENGINES. *(La pollution de l air par les moteurs de vehicules). Text in French. Rev. Serv. Publ., 32(2):51-56, 58,-63, 1970. 38 refs.*

Possibilities for the abatement of air pollution generated by vehicle engines, and actual exhaust emission tests performed on diesel and gasoline engines are presented. Black smoke, the principal emission from diesel engines, can be essentially abated by proper maintenance to provide for good fuel distribution and air excess, as well as by avoiding overload. Smoke tests performed on 28,047 diesel vehicles in Belgium by means of Hartridge smokemeter revealed that the smoke indices were in excess of 75 Hartridge units in 9.8% of all vehicles tested. For gasoline engines, the European cycle permits 100 to 220 g of carbon monoxide and 8.0-12.8 g of hydrocarbons per test for homologation trials, and 120 to 264 g of CO, as well as 10.4-16.6 g of hydrocarbons per test for production, depending on the equivalent inertia which ranges from 680 kg to 2270 kg. Electronic injection, double carburetion for city and highway traffic, the use of dash pot, ignition timing, reduction of the dosage during deceleration, and the use of a special pipe for improved fuel homogenization and distribution among the cylinders are the basic possibilities to abate air pollution generated by gasoline engine vehicles.

36995 **APTIC NO. 59230**

Frasca, Ralph L.

HANDLING OF INSULATED COPPER WIRE SCRAP. *National Assoc. of Secondary Material Industries, Inc., New York, Air Pollut. Control Technol., Proc. Workshop, Chicago, Ill., 1970, p. 107-116. (Oct. 22.)*

Some of the basic problems encountered in the removal of insulation during the recovery of the conducting materials and the type of auxiliary equipment necessary to operate within air pollution control regulations are discussed. The most frequently used method is burning off. The insulations considered are polyethylene, polypropylene, polyvinyl chloride, teflon, nylon, neoprene, rubber and paper. Once ignited, polyethylene generates hydrocarbon gases which burn intensely. Burning under controlled conditions, only carbon dioxide and water vapor will be emitted. The necessary controls consist of a primary combustion chamber in which the burning rate is limited, and a secondary combustion chamber which is fired by auxiliary fuel and provided with overfired air. A high temperature secondary combustion chamber with sufficient air supply will completely burn the volatilized hydrocarbons giving a clean or steamy plume. The removal of polypropylene is like that of polyethylene. Facilities to handle polyvinyl chloride insulated wire should include a primary distillation chamber provided with a means of supplying the heat and temperatures necessary to start and continue at a reasonable rate the combustion of this flame retarding material, a secondary combustion chamber with an auxiliary fuel fire plus overfired air to complete the combustion of the carbonaceous materials, and a scrubbing unit to remove the hydrogen chloride fumes and metallic salts. Paper insulation on burns with too many problems of an air pollution nature. Fly ash is the biggest problem and this can be removed by a cyclone, electrostatic precipitator, or a wet scrubber. Processing of nylon insulation with primary and secondary combustion chambers will emit a gas containing mostly carbon dioxide and water. Since hydrogen chloride will be generated by burning neoprene, the gases must be passed through a scrubber. The burning of teflon releases hydrogen fluoride, and great care should be exercised.

1968

36996 **APTIC NO. 59904**

Pilney, J. P. and E. E. Erickson

FLUIDIZED BED FLY ASH FILTER. *J. Air Pollution Control Assoc., 18(10):684-685, Oct. 1968.*

Removal efficiencies of fly ash from air streams by a fluidized bed of soils were measured experimentally by a 4-inch glass fluidization column. The fly ash used has a mass median diameter of 8 micron and a geometric standard deviation of 2.5. The effects on fly ash removal of the following variables were investigated: the particle size of the bed medium, fluidization characteristics of the bed medium, time of run (5-40 min), bed depth (0.5-2.75 in.), fly ash loadings of the fluidized air (0.23-10.7 grains/cu ft), superficial velocity (0.3-2.1 ft/sec), and humidity of the fluidizing air. The effect of the nature of the bed medium on fly ash removal was studied. Removal efficiencies of 83-92% occurred in 1.5-inch-deep beds at a superficial air velocity of 1.6 ft/sec. Much of the fly ash in the effluent air stream was agglomerates, 80 micron or less in size. Thus, a cyclone located downstream of the bed would give higher removal efficiency. In experiments using 400-micron fly ash as the bed medium, 0.5-inch beds fluidizied at 0.5 ft/sec gave 98.5% removal efficiency at humidity of 45% and complete removal at humidity greater than 70%. Making the particles sticky increased removal efficiency from 85 to 95%. Attempts to fluidized 125-micron sticky particles resulted in defluidization of the bed. Fluidization of 125-micron non-sticky particles at 0.3 ft/sec gave removal efficiencies greater than 98%. In a study of the electrostatic properties of fluidized beds, removal efficiencies as high as 99.7% resulted with polystyrene beads.

1966

36997 **APTIC NO. 59945**

Visarionov, Vasil, Parush Parushev, Vasil Stratiev, Milcho Milchev, and Dencho Kerchev

RECOVERY OF CADMIUM AND ZINC FROM DUST OF LEAD PRODUCTION. *(Izvlichane na kadmiya i tsinka ot prakhovete na olovnoto proizvodstvo). Text in Bulgarian. Rud. Metal., no. 21:27-28, 1966. 4 refs. (Translation available from the National Translation Center as 73-10537-11F.)*

An industrial process for the recovery of cadmium, zinc, and copper from burned lead dust is described. The lead dust, whose bulk is in the fraction below 1 mm, is treated with sulfuric acid (spent electrolyte) at 70-90 C under permanent agitation until the acidity falls to 5-10 g/l from an initial value of 70 g/l in 4 to 5 hr. The pulp obtained is filtered in a vacuum filter, after which the filtrate is further concentrated. The concentrate contains about 100 g of zinc, 4-5 g of iron, 0.6 g of copper, 0.1 g of thallium, and 8-10 g of chlorine per liter. The concentrate is further enriched to increase its cadmium concentration. The rates of recovery determined for zinc and cadmium are 84% and 90%, respectively.

MEASUREMENT METHODS

1974

36998 **APTIC NO. 60338**

Andreatch, A. J. and J. C. Elston

EVALUATION OF AN IDLE INSPECTION AND MAINTENANCE EQUIPMENT NETWORK. *Preprint, Society of Automotive Engineers, 44p., Feb. 1974. 12 refs. (Presented at the Society of Automotive Engineers, Congress, Exposition, Detroit, Mich., Feb. 1974.)*

In the first year of the nonmandatory phase of New Jersey idle inspection/maintenance program over three million vehicles were tested in the State s 39 inspection stations. Some equipment, procedural, and vehicle-oriented variables which can occur in an on-line system are discussed, and the relationship of garage-type analyzers to the inspection network is presented. The inspection equipment, its performance with design specifications, operational procedures and manpower constraints with respect to mass production quality control applications, and infrared exhaust equipment are described and discussed. When taken collectively, inspection testing variables place an upper limit on the rejection rate that can be implemented in an idle inspection/maintenance control strategy. The New Jersey inspection standards for % carbon monoxide and ppm hydrocarbons effective July 5, 1972, July 1, 1974, and July 1, 1975 for 1970-1974 are 6.0 and 600, 5.0 and 500, and 4.0 and 400, respectively. (Author abstract modified)

36999 **APTIC NO. 59891**

Baum, F.

THE ANALYSIS OF OIL DERIVATIVES IN THE WASTE GASES FROM OIL-FIRED FURNACES. *(Nachweis von Oelderivaten in Abgasen von Oelfeuerungen). Text in German. Oel Gasfeuerung, 19(3):210-216, 1974. 19 refs.*

At the determination of the soot number in waste gases from oil- fired furnaces with filter paper, the spots on the filter are yellow to brown. These spots are due to oil derivatives in the waste gases. The emission of oil derivatives is prohibited in the states North Rhine Westphalia, Lower Saxony, Hamburg, and Bavaria. With a simple method based on paper chromatography, oil derivatives can be analyzed. Upon dipping of the filter paper into pyridine as a solvent for the oil derivatives, the solvent front travels along the paper. If it crosses spots on the filter paper, the oil derivatives in it are dissolved and leave colored traces which are visible on the front as well as back side of the filter. Spots which contain no oil derivatives leave no color traces. The method, called the pyridine test, is already routinely applied and will be included in the new technical directives for the conservation of clean air.

37000 **APTIC NO. 60217**

Bhardwaja, P. S., Jack Hebert, and Robert J. Charlson

REFRACTIVE INDEX OF ATMOSPHERIC PARTICULATE MATTER: AN IN SITU METHOD FOR DETER-

MINATION. *Appl. Opt., 13(4):731-734, April 1974. 12 refs.*

A method is proposed for measuring the refractive index of atmospheric aerosols (real part of the refractive index) with in situ conditions. Mathematical expressions are given for the total scattering coefficient and the backward hemispheric scattering coefficent. Computer calculations are performed to determine the values of these parameters, assuming that the particles are spheres of known refractive index and have a size distribution given by Junge s power law. The range of the real part of the refractive index is assumed between 1.3 and 2.3, and the imaginary part is assumed as 0.000, 0.005, and 0.05. The real part of the refractive index is varied by 0.05 for each set of data points (keeping the imaginary part of the refractive index constant for each set). Results of the calculations are graphically depicted.

37001 **APTIC NO. 60081**

Boppel, B.

LEAD CONTENTS OF FOODSTUFFS. 1. ON THE ANALYSIS OF LEAD IN FOODSTUFFS. *(Bleigehalte von Lebensmitteln. 1. Zur Analytik der Bleibestimmung in Lebensmitteln). Text in German. Fresenius Z. Anal. Chem., 268(2):114-119, 1974. 13 refs.*

Possible errors in the determination of lead and a method to minimize these are outlined. The dependence on temperature of the loss of Pb during the dry ashing procedure was determined by immersed thermocouples. It is not advisable to transfer ashing data from one foodstuff to another; they should be determined separately experimentally. Many matrix elements in ash solutions influence Pb determination by atomic absorption spectroscopy. By coprecipitation with silver ions in hydrogen sulfide this difficulty can be avoided. This should be preceded by a nitrate-carbonate melt to remove the residual carbon from the ash and thus make it unnecessary to treat with hydrofluoric acid. The Pb content in the final solution is determined in an atomic absorption spectrophotometer by comparison with a standard solution of appropriate concentration.

37002 **APTIC NO. 60237**

Brodie, K. G. and J. P. Matousek

DETERMINATION OF CADMIUM IN AIR BY NON-FLAME ATOMIC ABSORPTION SPECTROMETRY. *Anal. Chim. Acta, 69(1):200-202, March 1974. 6 refs.*

A method for the determination of cadmium in air by non-flame atomic absorption spectrometry is described; the procedure combines freedom from contamination with speed of analysis. A GSWP Millipore filter with a mean pore size of 0.22 micron is treated with (1 plus 2) hydrochloric acid, washed with distilled water, and dried before use. A disc cut from the filter is inserted into a graphite sampling cup, and particulate matter from samples of up to 400 ml is collected on the filter by drawing air through the cup with a portable pump. The collected sample is treated directly in the cup with 2 microliters of 1000 ppm phosphoric acid for conversion of the cadmium in the sample to a less volatile form, i.e., cadmium phosphate. Aqueous cadmium standards with the same addition of phosphoric acid are deposited on the filter disc in the sampling cup. Drying for 15 sec, ashing for 10 sec, and atomization for 3 sec are then performed in sequence, ensuring that there is no non-atomic contribution to the atomic peak generated during the atomization stage. Absolute sensitivity is 1.5 times 10 to the minus 12 g, corresponding to 0.008 microgram Cd/cu m with a 200 ml air sample; relative standard deviation is 4%.

37003 **APTIC NO. 60029**

Chan, S. H., D. Nelson, M. J. D. Low, and H. Mark

HIGH-RESOLUTION INFRARED SPECTRA OF AIR POLLUTANTS WITH FOURIER TRANSFORM SPECTROSCOPY. *J. Quant. Spectro. Radiative Transfer, 14(4):287-298, April 1974. 11 refs.*

A Fourier transform spectrometer coupled with a long-path cell was used to record high resolution infrared spectra of air pollutants at very low concentrations. The spectral transmittance curves of carbon monoxide were measured at room temperature, at a constant resolution of 0.5/cm, at partial pressures from 2.32 to 0.004 torr, and with nitrogen as the diluent. Apparent absorption coefficients were tabulated at 0.2/cm intervals. Spectra were also recorded for ethane, water, ammonia, carbon dioxide, sulfur dioxide, methane, hydrogen chloride, and other gases. The techniques and data were applicable to studies of our contaminated atmosphere. (Author abstract modified)

37004 **APTIC NO. 60291**

Charlson, R. J., A. H. Vandepol, D. S. Covert, A. P. Waggoner, and N. C. Ahlquist

SULFURIC ACID-AMMONIUM SULFATE AEROSOL: OPTICAL DETECTION IN THE ST. LOUIS REGION. *Science, 184(9133):156-158, April 12, 1974. 12 refs.*

Nephelometric sensing of the deliquescence of ammonium sulfate produced by the reaction of sulfuric acid or ammonium bisulfate aerosol with ammonia provides a means for detecting these substances in the air. The basic measurement apparatus is a humidograph which measures the dependence of the light scattering coefficient of the particulate matter on the relative humidity. The system can be operated with the injection of a few ppm of ammonia into the sample flow, causing the reaction of H2SO4 and NH4HSO4 to form (NH4)2SO4. Field experiments showed these to be dominant substances in the submicron, light-scattering aerosol in the St. Louis region. The system was operated at one rural and two urban sites in St. Louis. It seemed likely that human sources of sulfur dioxide were the dominant source of sulfate aerosol. (Author abstract modified)

37005 **APTIC NO. 59886**

Chovin, Paul and Claudie Delaunay

ON THE MECHANISM OF THE GRIESS-SALTZMAN REACTION USED FOR THE DETERMINATION OF NITROGEN DIOXIDE IN POLLUTED AIR. *(Sur le mecanisme de la reaction de Griess-Saltzman utilisee pour le dosage du dioxyde d azote dans les atmospheres polluees). Text in French. C.R. Acad. Sci. (Paris) Ser. D), 278(1):137-140, Jan. 1974. 8 refs.*

The mechanism of the chemical reactions involved in the Griess- Saltzman method of determining nitrogen dioxide concentrations in the air was studied. The azo dye formation represents the result of several, partly favorable, partly competing, reactions. The anomalies observed in the stoichiometry of the Griess-Saltzman reaction (ratio of NO2 ions to NO2) are explained from the individual processes involved in the action of NO2 on water. Reduction of the stoichiometry with increasing in-the-air NO2 concentration from 200 to 1000 micrograms/cu m was determined. Any reaction tending to consume NO2 without producing NO2 ions, or NO2 ions for the formation of nitrate ions, reduced the stoichiometry. Rapidly diazotizable amines have beneficial effect on the stoichiometry.

37006 **APTIC NO. 60053**

Cooper, Douglas W. and Lloyd A. Spielman

A NEW PARTICLE SIZE CLASSIFIER: VARIABLE-SLIT IMPACTOR WITH PHOTO-COUNTING. *Atmos. Environ., 8(3):221-232, March 1974. 20 refs.*

A novel instrument for measuring aerosol particle size distributions is described. The device exploits inertial impaction for a useful measure of particle size and photo detection for speed for particle counting. Upon fixing the angles of the surfaces bounding the two-dimensional air flow, the geometry is self-similar at all settings of the variable jet width; moreover, at fixed volume flow rate, the jet Reynolds number is fixed. Dynamic and geometric similarity then implies that impaction efficiency depends on a single dimensionless group, the Stokes number, which under certain conditions is proportional to the ratio of particle radius to jet width; thus, calibration for all particle sizes is accomplished simply by varying the jet width using a single particle size. Tests using monodisperse latex particles confirmed the expected scaling features and showed that decreasing the angle between plate and impaction surface improved size discrimination. The advantages of the new impactor are its rapidity, flexibility, continuously adjustable size intervals, and ease of calibration. The impactor and photocounter can size particles having aerodynamic diameters ranging from 0.5 to 5-10 micron. (Author abstract modified)

37007 **APTIC NO. 59335**

DeLong, H. P.

AIR POLLUTION FIELD STUDIES WITH A RAMAN LIDAR. *Opt. Eng., 13(1):5-9, Jan.-Feb. 1974. 15 refs.*

The experimental results obtained with the Edgewood Raman Lidar and those obtained by others indicates this technique is potentially a very useful tool is pollutant monitoring. The device offers the capability of monitoring pollutants from ranges in excess of 400 m plus potentially allowing three-dimensional tracking of a pollutant cloud. Before Raman Lidar becomes a technique readily available for routine analysis or for spot checking of potential pollution sources, a number of advances must be made in instrumentation and electron-optics. Raman Lidar techniques have been discussed theoretically and sensitivities for various pollutants have been predicted. The results of the present real Raman Lidar indicates pollutant levels between 40-700 ppm in the present sensitivity but very realistic projections based on this data suggest sensitivities between 0.4-7 ppm could be reached if nondispersive detection techniques were used. Some of the pollutants considered are nitrogen, oxygen, carbon monoxide, carbon dioxide, nitric oxide, nitrous oxide, sulfur dioxide, methane, hydrogen sulfide, ammonia, chlorine, ethane, and hydrogen.

37008 **APTIC NO. 59310**

Deshpande, J. M.

X-RAY FLUORESCENCE - AN INTERNATIONAL CALIBRATION METHOD. *Experientia Suppl. no. 20:139-143, 1974. 6 refs.*

The advantages in adopting the x-ray fluorescence method as an international calibration method, particularly for the estimation of sulfur dioxide and particulate matter, are cited. The method is free from all of the problems associated with wet chemical methods such as evaporation of solutions (in tropical countries), freezing of solutions (in temperate countries), or spilling; its simplicity results in fewer experimental errors. The method could be used to calibrate other instruments against itself rather than the employment of x-ray fluorescence spectrometer systems at each monitoring location. Examples are given of its successful application to the measurement of sulfur dioxide (2-500 micrograms) and its extension down it the 0.1 microgram level.

37009 **APTIC NO. 60005**

Endo, Fumio

POLLUTION-MEASURING TECHNIQUES -- (NO. 5) METHODS OF MEASURING AUTOMOBILE EXHAUST. *(Kogai no keisoku gijutsu -- (No. 5) Jidosha haishutsugasu no sokuteiho). Text in Japanese. Otomeshon (Automation), 19(1):119-124, Jan. 1974. 2 refs. 59443 Green, B. D. and J. I. Steinfeld MONITORING ATMOSPHERIC POLLUTION LEVELS BY LASER RANGING SYSTEMS. Experientia Suppl., no. 20:125-137, 1974. 26 refs.*

The use of optical ranging schemes employing lasers (Raman backscattering, resonance fluorescence backscattering, and long-path absorption) is reviewed, and a system for monitoring atmospheric nitrogen dioxide with tunable organic dye lasers at levels of less than 1.0 ppm is proposed. Long path absorption appears to be the most promising of the methods considered for atmospheric surveillance; measurement of transmission variation from elastically backscattered laser light is competitive with Raman or fluorescence detection even for depth resolution from a fixed monitoring station. The most versatile tunable system appears to be the dye solution laser. The bandwidth and center wavelength can be varied at will throughout the optical components in the laser capacity; and the pulsed mode of operation which is the most suitable for atmospheric monitoring permits the deliverance of several tenths of a joule of optical energy in about a microsecond (if flash-pumped) or 10 nanoseconds (if pumped by a Q-switched ruby or Nd:YAG laser). A system for monitoring atmospheric NO2 is proposed which would use a flashlamp-pumped coumarin or umbelliferone dye laser and have an output of 0.1 joule at 4200-400 A. The beam would be sent through the polluted atmosphere to retroreflectors at a distance of two km.

37010 **APTIC NO. 59320**

Guedalia, D., C. Allet, and J. Fontan

VERTICAL EXCHANGE MEASUREMENTS IN THE LOWER TROPOSPHERE USING THB (PB-212) AND RADON (RN-222). *J. Appl. Meteorol., 13(1):27-39, Feb. 1974. 33 refs.*

Various methods of determining vertical eddy diffusion coefficients in the planetary boundary layer from two natural radioactive tracers, radon (Rn-222) and ThB (Pb-212), are presented and discussed. In all cases, it is more pertinent to measure vertical exchanges in the lower atmosphere using ThB (10.6 hr half-life) than Rn (3.8 days half-life). About 30 vertical profiles of Rn and ThB in the lower troposphere (100-3000 m) are determined over a 12-month period. Vertical eddy coefficient values are calculated according to the various methods discussed. The variation range, between 0.1 and several 100 sq m/sec, is large and closely related to the vertical temperature gradient variation. Low values .01 to 0.1 sq m/sec of the exchange coefficients determined in the inversion layer which frequently exists at the top of the planetary boundary layer show that vertical turbulent fluxes toward the free atmosphere are relatively small. (Author abstract)

37011 **APTIC NO. 60014**

Hartkamp, Heinrich and Hermann Gies

DESIGN AND PROPERTIES OF A GENERATOR FOR PRODUCING OZONE TEST GASES. *(Aufbau und Eigenschaften eines Generators zur Erzeugung von Ozon-Pruefgasen). Text in German. Staub, Reinhaltung Luft, 34(3):95-98, March 1974. 14 refs.*

Arrangements for the measurement of ozone contents in ambient air can easily be calibrated with test gas mixtures of varying O3 content. Such test gas mixtures can now be generated from oxygen or O2-containing mixtures in a simple photochemical reactor, the essential elements of which are a mercury lamp, an irradiation chamber with spherical calotte shape, and a set of optical diaphragms. The activating light flux can be varied in small steps, by means of the diaphragm setting. The O3 contents obtained are small and reproducible. (Author abstract)

37012 **APTIC NO. 59332**

Heindryckx, R. and R. Dams

EVALUATION OF THREE PROCEDURES FOR NEUTRON ACTIVATION ANALYSIS OF ELEMENTS IN ATMOSPHERIC AEROSOLS USING SHORT-LIVED ISOTOPES. *Radiochem. Radioanal. Lett., 16(4):209-225, Feb. 1974. 7 refs.*

Three different short procedures for neutron activation trace analysis of ambient aerosol samples, collected on cellulose filters, and proposed. In all three procedures a flux monitor is used and the samples are irradiated and counted following a rigid scheme, of respectively 40 19, and 20 min. The results obtained by the three methods for the elements sodium, aluminum, chlorine, vanadium, manganese, calcium, and bromine are compared. The reproducibilities are generally better than 10% and the results from the three methods agree within the standard deviations. (Author abstract)

37013 **APTIC NO. 59601**

Heiyden, Ludger van and Karl Wienke

METHODS FOR THE MEASUREMENT OF EMISSIONS OF THE OXIDES OF NITROGEN IN COMBUSTION WASTE GASES. *(Verfahren zur Messung von Stickoxidemissionen in Feuerungsabgasen). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 115(3):125-131, 1974. 20 refs.*

Until very recently the monitoring of emissions of oxides of nitrogen was limited almost exclusively to plants emitting concentrations in the % range. The discovery of far lower oxides of nitrogen concentrations in the off-gases from nearly all technical firing systems, which require monitoring because of the extent and the effect of these emissions, called for continuously operating analyzers with a measurement range of zero to 100 ppm per vol and less. Intense developmental work led to an improvement of the familiar light absorption methods. For nitric oxide infrared absorption analyzers are nowadays offered with a smallest measurement range of 0 to 300 ppm per vol; for nitrogen dioxide, photometric measurement is available in the visible blue or ultraviolet range from 0 to 100% by vol. The development of the new chemiluminescence method for NO finally permits the measurement of concentrations far below 100 ppm (smallest measurement range for emission analyzers 0 to 0.01 ppm by vol. The catalytic reduction of NO2 to NO as preliminary step to chemiluminescence analysis is satisfactory only for oxidizing off-gases. Reliable NO test gases can be produced, while production of NO2 test gases still poses some difficulties. As a consequence of the development of automatic analyzers, wet chemical determination methods which can be applied only discontinuously become less and less important. Test tubes will continue to be used for first indicative values.

37014 **APTIC NO. 59299**

Hicks, Jackson E., James E. Fleenor, and Harold R. Smith

THE RAPID DETERMINATION OF SULFUR IN COAL. *Anal. Chim. Acta, 68(2):480-483, Feb. 1974. 6 refs.*

Data are presented to indicate the satisfactory determination of sulfur in coal by combustion and subsequent automatic titration of the bomb-washings with lead perchlorate solution and a lead-selective electrode. A determination of the bomb-washings is attractive insofar as it simultaneously enables a determination of calorific value, and the use of a recording titrator and an ion-selective electrode provides the rapidity and precision desired. Air should not be flushed from the bomb during pressurization with oxygen and a double-junction reference electrode should be used. The electrode surface usually requires cleaning with an abrasive after 10-15 titrations. Ten determinations of sulfur in a typical coal by the proposed potentiometric method gave an average value of 0.79% S with a standard deviation of 0.027%.

37015 **APTIC NO. 59336**

Hirschfeld, Tomas B.

LONG PATH INFRARED SPECTROSCOPIC DETECTION OF ATMOSPHERIC POLLUTANTS. *Opt. Eng., 13(1):15-18, Jan.-Feb. 1974. 8 refs.*

Long path infrared spectroscopy of air pollutants is operationally classified into several system types: long folded path samplers, two station remote instruments using either a remote source or a remote retroreflector, and one-station remote instruments using either natural sources, laser backscatter, remote fluorescence, or passive measurement of sample thermal emission. The operational requirements of each system are described, as are their advantages, disadvantages, and one example each of their results. A comparison of their overall performance reveals that the best system now available would be a two-station remote device with an array of distal retroreflectors, employing a correlation Fourier Transform Spectrometer as a receiver. The main application of such a system would be the detection of widely dispersed pollutants at extremely low concentrations. (Author abstract)

37016 **APTIC NO. 60278**

Israel, Gerhard W.

EVALUATION AND COMPARISON OF THREE ATMOSPHERIC FLUORIDE MONITORS UNDER FIELD CONDITIONS. *Atmos. Environ., 8(2):159-166, Feb. 1974. 15 refs.*

Atmospheric fluoride levels were monitored at up to 22 stations in the vicinity of an alumina reduction plant by bicarbonate coated tube samplers, by a dual paper tape sampler, and by limed filter papers as part of a field evaluation and comparison of the three fluoride monitors. The bicarbonate tube sampler allowed classification of fluoride emissions by physical state; total atmospheric fluoride in the vicinity of the plant was 13% in gaseous form, 64% in particulate form, and 23% in gaseous form sorbed on aerosols. The dual tape sampler showed the same separation characteristics for gaseous and particulate fluorides but was incapable of distinguishing between free gaseous fluoride and that sorbed on aerosols. A significant correlation appeared to exist between fluoride accumulation by limed filter papers and total gaseous fluoride content on an annual basis, confirming the fact that limed filter papers are good indicators for free gaseous fluoride. The limed filters were, however, rather insensitive to the particulate component. (Author summary modified)

37017 **APTIC NO. 60012**

Johnson, J. L., A. C. Ottolini, F. A. Forster and R. B. Loranger

THE DETERMINATION OF SULFUR, LEAD, AND SILICON IN ATMOSPHERIC AEROSOLS: AN APPLICATION OF X-RAY FLUORESCENCE AND CONFINED-SPOT PAPER TECHNIQUES. *Mikrochim. Acta, no. 2:145-150, 1974. 6 refs. (Presented at the ANACHEM Conference, Dearborn, Mich., 1972.)*

An x-ray fluorescence-confined spot technique has been developed and used for the determination of sulfur in compounds from air samples collected on small membrane filters and for lead and silicon in compounds for air samples collected on paper tape. On 100-sq mm spots, the minimum detectable limit for S is 0.15 microgram, for lead and silicon it is 0.4 microgram. The technique is simple, precise, and rapid and should be applicable to the determination of elements above atomic number 12.

37018 **APTIC NO. 60178**

Kawaguchi, Hiromi and Junichi Ikeda

STANDARDIZATION OF POLLUTION MEASURING INSTRUMENTS AND MEASURING METHODS FOR INCORPORATION INTO JAPAN INDUSTRIAL STANDARDS (JIS). *(Kogai sokutei kiki oyobi sokutei hoho no JIS-ka ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(4):30-36, April 1974.*

A pollution measuring instrument designated as a densitometer under the measurement regulations is subject to specific quality inspection by the competent government agency from now on. Nevertheless, there are already about 60 manufacturers offering various pollution measuring instruments whose operating principles and measuring errors and scales vary with the manufacturer. Therefore, there is poor correlation among data obtained by measuring instruments of different brands. Another problem is lack of standardized methods regulating the sampling process, pretreatment of the sample, and process of disposal of interfering or co-existing substances. In view of this and the fact that JIS is often referred to for measurement methods, it is necessary to standardize automatic measuring instruments, especially those for air pollution monitoring. A project to achieve standardization of automatic air pollution measuring instruments has been underway since 1971 and is expected to be incorporated in JIS between 1973 and 1976. The standards so far established with regard to automatic air pollution measuring instruments are JIS B 7951 for the automatic analyzer of atmospheric carbon monoxide, JIS B 7952 for that of atmospheric sulfur oxides, JIS B 7953 for that of atmospheric oxides of nitrogen, and JIS B 7954 for the automatic dust meter for suspended dust in the atmosphere. The sampling and measurement methods for air pollutants standardized by JIS include JIS K 0095 and 17 others. Many others considered for standardization or revision are listed.

37019 **APTIC NO. 59636**

Kroes, A. de

SULFUR DIOXIDE ANALYZER. *(Zwaveldioxyde-analysator). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 29(2):48-51, Jan. 1974.*

The Picoflux 2 analyzer, developed for the continuous measurement of small sulfur dioxide concentrations in the air, is described. The instrument can be automatically switched to either of the two measuring ranges of 0-1 and 0-5 mg/cu m. The error is less than 5% of the entire range. The air to be analyzed for SO2 is passed through a selective filter for the removal of ammonia, hydrochloric acid, chlorine, hydrogen sulfide, and dust. The SO2 is then absorbed in a reagent (slightly acidified distilled water with small quantity of hydrogen peroxide). The absorbed SO2 is oxidized to sulfuric acid quantitatively, and the increase in the electric conductivity of the reagent solution is measured. The increase in the conductivity is proportional to the SO2 concentration in the air.

37020 **APTIC NO. 59853**

Leschonski, K., W. Alex, and B. Koglin

PARTICLE SIZE ANALYSIS. ILLUSTRATION AND EVALUATION OF PARTICLE SIZE DISTRIBUTIONS (CONTINUATION). *(Teilchengroessen-analysen. Darstellung und Auswertung von Teilchengroessenverteilungen (Fortsetzung)). Text in German. Chem.-Ing.-Tech., 46(3):101-106, 1974. 17 refs.*

In many cases, the empirically determined characteristic of accumulative distribution curves can be approximately described by a mathematical function. Such approximative functions permit the preparation of special draft papers in which the function can be illustrated as straight line. The most familiar distributions of particle size analyses are the Gaudin-Shuhmann distribution, the Rosin-Rammler-Sperling Bennett distribution, and the normal distributions. The determination of the average values of these distributions is reviewed. The specific surface which can be derived from the particle size distribution is calculated, and the graphic determination of the specific surface is described. Application of the derived formulae is demonstrated by two examples.

37021 **APTIC NO. 60259**

Levaggi, Dario, Evaldo L. Kothny, Theodore Belsky, Emilio de Vera, and Peter K. Mueller

QUANTITATIVE ANALYSIS OF NITRIC OXIDE IN PRESENCE OF NITROGEN DIOXIDE AT ATMOSPHERIC CONCENTRATIONS. *Environ. Sci. Technol., 8(4):348-350, April 1974. 24 refs.*

Chromium trioxide was tested as a replacement for the potassium permanganate-sulfuric acid solutions designed to oxidize nitric oxide for conversion and detection as nitrogen dioxide. The CrO3 oxidizer was prepared by soaking firebrick in a 17% solution of pure CrO3, draining, and drying at 105 C. The final loading was about 10% by weight. A humidifier with a shortened inlet tube was used to blow the air-stream over the water, as opposed to bubbling through, since the optimal relative humidity working range of the CrO3 oxidizer without H2SO4 was higher (35-90%) than the material mixed with H2SO4, this gave a relative humidity of about 70-80%. Three to 5 g of the hydrated oxidizer was placed in a midget impinger. An interesting and desirable feature of the CrO3 oxidizer was its color change when hydrated (dull yellow) or dehydrated (dull pink) and when its oxidizing ability was spent (greenish brown). The impinger required change before more than half depletion occurred, and the oxidant appeared to have a lifetime of at least 3 months at ambient levels of NO. Oxidation efficiency was close to 100%. (Author abstract modified)

37022 **APTIC NO. 59384**

Moretti, E., G. Leofanti, D. Andreazza, and N. Giordano

GAS CHROMATOGRAPHIC SEPARATION OF EFFLUENT FROM THE AMMONIA OXIDATION REACTION: O2, N2, N2O, NH3, AND H2O. *J. Chromatographic Sci., 12(2):64-66, Feb. 1974. 9 refs.*

A gas chromatographic method for quantitative analysis of all the products from an ammonia oxidation reaction has been developed which uses two columns and a very simple apparatus. The treatment of Chromosorb 102 with THEED (tetrahydroxy-ethyl-ethylen- diamine) allows complete separation and symmetrical peaks for unreacted NH3 and water vapor. A typical chromatogram obtained under optimum conditions is given. Time allowed for complete analysis is 45 sec. Good linearity and reproducibility is observed. Detection limits were 0.1% for NH3 and 0.05% for nitrous oxide, nitrogen, oxygen, nitric oxide, and nitrogen dioxide.

37023 **APTIC NO. 60077**

Morita, Yazaemon

MEASURING METHODS FOR TOTAL NITROGEN AND EACH TYPE NITROGEN, PRESENT AND FUTURE. *(Zenchisso to kakutai chisso no sokuteiho ni kansuru genjo to kongo no doko). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(3):1492-1497, March 1974.*

The basic chemical reactions of the Kjeldahl method for total nitrogen, in which the sample is decomposed in concentrated sulfuric acid and the N2 present converted into ammonia for determination, still remain unknown because of their extreme complexity. Knowing them would extend the usefulness of the method, especially when used in automatic analyzers. One application which would be extended is the process in which the form of a compound is determined by the quantity of H2SO4 and sample consumed by the reaction. Another is that by which the form of a compound is determined by reaction and decomposition rates.

37024 **APTIC NO. 60277**

Moyers, Jarvis L. and Robert A. Duce

THE COLLECTION AND DETERMINATION OF ATMOSPHERIC GASEOUS BROMINE AND IODINE. *Anal. Chim. Acta, 69(1):117-127, March 1974. 15 refs.*

A procedure for the isolation, collection, and analysis of atmospheric gaseous iodine and bromine is presented. Particulate matter is removed from the airstream to be sampled by electrostatic precipitation, and the gaseous halogen species are adsorbed onto specially cleaned activated charcoal. The charcoal sample is irradiated with thermal neutrons, and the iodine and bromine are then removed from the charcoal, isolated, and purified as the silver halide precipitate. The amounts of gaseous iodine and bromine are then determined by beta-counting. The system works well for air sheds with low particulate iodine and bromine concentrations relative to that in the gaseous phase; in air sheds where the particulate halogen predominates, the gas phase measurements are more uncertain. (Author summary modified)

37025 **APTIC NO. 60309**

Nader, John S., Fredric Jaye, and William Conner

PERFORMANCE SPECIFICATIONS FOR STATIONARY-SOURCE MONITORING SYSTEMS FOR GASES AND VISIBLE EMISSIONS. *National Environmental Research Center, Research Triangle Park, N. C., Chemistry and Physics Lab., Program Element 1AA010, Environmental Protection Agency-650/2-74-013, 86p., Jan. 1974. 9 refs.*

NTIS: PB 230934/AS, GPO

Parameters for evaluation of the performance of continuous monitors for the measurement of emissions and stationary sources were delineated and defined. Field testing programs were conducted to provide technical background on the availability and applicability of commercially available source monitoring instrumentation. The technical data generated by these field studies are shown as the basis for the development of performance specifications and of test procedures by which these specifications can be verified. Examples are given of how performance specifications may be applied in conjunction with test procedures as guidelines in the assessment or selection of monitoring systems for pollutant gas emissions and visible emissions from stationary sources. Applicability of these guidelines are discussed within the constraints of specified pollutant industry combinations and utilizations of the data generated. (Author summary)

37026 **APTIC NO. 60317**

Nader, John S.

OSA OPTICAL RESOURCE LETTER. OPTICAL METHODS IN AIR POLLUTION MEASUREMENT. *Preprint, National Environmental Research Center, Research Triangle Park, N. C., Chemistry and Physics Lab., 10p., 1974 (?). 22 refs.*

Optical methods in air pollution measurement are reviewed in relation to their importance for support of standards and regulations and their importance to such areas as mobile and stationary sources, emission control effectiveness evaluation, formation and decay studies of pollutants, diffusion and transport mechanisms in the urban atmosphere, ambient air quality monitoring, and health effects assessment. Remote sensing and long path sampling schemes can only be effectively executed by electro-optical techniques; thus, for example, lidar scattering and infrared and ultraviolet spectroscopic techniques lend themselves to three-dimensional probing of the atmosphere, plume profiling, and remote source emission measurements. Reduced visibility is the most obvious effect that is receptive to the application of optical techniques for its measurement. Remote sensing of inversion heights and atmospheric probing to determine wind velocities at various elevations are examples of measurement methods being developed for meteorological studies, and the use of differential absorption lidar is in the foreground of advanced developments in three-dimensional probing of the atmosphere. National ambient air quality standards (primary and secondary) are summarized in tabular form for sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen oxides as are new stationary source performance standards for sulfur dioxide, nitrogen oxides, particulates, and visible emissions.

37027 **APTIC NO. 59970**

Nakajima, Masaru

PROBLEMS ON MEASUREMENTS OF EXHAUST GAS EMISSION FROM DIESEL ENGINES. *(Diizeru enjin haishutsu gasu sokuteijo no mondaiten). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(3):183- 188, March 1974. 8 refs.*

The interfering elements affecting measurement of nitric oxide and carbon monoxide by the non-dispersive infrared analyzer (NDIR) and hydrocarbons by the hydrogen flame ionization analyzer (FID) in diesel engine exhausts are discussed. The elements affecting the NO measurement by the NDIR include water, carbon monoxide, carbon dioxide, and hexane, of which water gives the greatest interference. The interfering effects of CO, CO2, and C6H14 can be reduced by a filter to a practically negligible level. A filter alone does not remove the interfering effect of water. Even when a dessicative was used to adsorb the water content, measured values tended to be higher with time or repeated use, indicating an inconsistency in the method. In view of this, an electron refrigeration dehumidizer was used in place of the dessicative. This gave accurate and consistent measurement of NO. There is no significant interference affecting the CO measurement. Correction formulas needed to correct the measured values due to the fact that both NO and CO are measured after the exhaust gas is dehydrated as mentioned above are also discussed. Problems of FID applied to the HC measurement including the oxygen interference are discussed.

37028 **APTIC NO. 59301**

Nand, Sachchida and M. K. Sarkar

ONE-STEP ANALYSIS OF A MIXTURE OF PERMANENT GASES AND LIGHT HYDROCARBONS BY GAS CHROMATOGRAPHY. *J. Chromatog., 89(1):73-75, 1974. 11 refs.*

The development of an analytical technique is described for mixtures of permanent gases and light hydrocarbons with a single sample injection using hydrogen as the carrier gas and without the use of any sub-ambient temperature programming. A Perkin-Elmer (Model 900) chromatograph was modified and two standard Poropak Q columns were fitted inside the programmed oven of the dual column chromatograph. Initially, the Poropak and molecular sieve columns were arranged in series, and nitrogen, oxygen, methane, and carbon monoxide were allowed to leave the first column (50 degrees) and enter the second. Then the molecular sieve was by-passed and carbon dioxide and hydrocarbons were allowed to leave the first column with temperature programming and pass into the detector. Subsequently, the effluent from the first column was again allowed to pass through the molecular sieve so as to separate N2, O2, methane, and CO. The time required for a complete analysis was about 30 min.

37029 **APTIC NO. 59344**

Natusch, D. F. S., J. R. Sewell, and R. L. Tanner

DETERMINATION OF HYDROGEN SULFIDE IN AIR--AN ASSESSMENT OF INPREGNATED PAPER TAPE METHODS. *Anal. Chem., 46(3):410-415, March 1974. 21 refs.*

The collection of hydrogen sulfide on paper tapes impregnated with silver nitrate, dicyanoargenate(I), mercuric chloride, or lead acetate followed by optical density determination of the metal sulfide formed appears to offer considerable advantage as a routine, general purpose method for the determination of H2S in air. A variety of parameters, including tape preparation, air flow rate, H2S concentration, relative humidity, light, and the presence of interfering gases, were investigated to determine their effects on H2S collection efficiency and the stability of the collected sulfide for each impregnating reagent, and tapes impregnated with silver nitrate were found highly suitable for determination of H2S concentrations in the range of 0.001-50 ppm. The method is simple, specific, portable, capable of unattended operation, and inexpensive and is highly recommended for both laboratory and field operation. (Author abstract modified)

37030 **APTIC NO. 59871**

Pfister, Ewald

AN INTEGRATION DEVICE FOR TEMPORAL EVALUATION OF EMISSIONS. *(Eine Integrationsien-*

richung zur zeitlichen Bewertung von Emissionen). Text in German. Staub, Reinhaltung Luft, 34(2):59-62, Feb. 1974. 1 ref.

A monitor is described for the emissions of cement works which automatically shuts off the plant upon excess of the maximum allowably emission concentrations. A smoke density meter is used for monitoring the emissions. Its operation is based on the prinicple of light extinction. The emitted light beam is divided into two branches, one passing through the measurement duct to the reflector, the other serving for comparison. The integration device commends three independently moving integral periods, a 6-hour integral, adjustable from 1 to 6 hours with 1/2-hour steps and 60 storage points; a 15-minute integral with 75 sec steps and 15 storage points adjustable from 2.5 min to 15 min; and a 9-minute integral adjustable from 1.5 min to 9 min with 45 sec intervals and 18 storage points. Assigned to the 6-hour integral is an alarm signal, an alarm contact, and a switch-off contact. The 15-minute integral has only an alarm signal and alarm contact; the 9-minute integral has an alarm signal, an alarm contact, and a switch-off contact. The signals are released by trigger stages assigned to each of the three integrals whose thresholds can be adjusted in a wide range. With the switched off integration device, the plant which is monitored cannot operate.

37031 **APTIC NO. 59889**

Poetzl, Karl

NEW METHODS FOR TRACE ANALYSIS OF SULFATE, CHLORIDE AND NITRATE ANIONS WITHIN THE SCOPE OF A LONG-TERM PROGRAM STUDYING THE STRUCTURE AND COMPOSITION OF ATMOSPHERIC AEROSOLS. *(Neue spurenanalytische Methoden fuer Sulfat-, Chlorid- und Nitrat- Anionen im Rahmen einer Langfristigen Untersuchung atmosphaerischer Aerosole). Text in German. Staub, Reinhaltung Luft, 34(2):55-59, Feb. 1974. 8 refs.*

Chemical composition of aerosols were determined including sodium, potassium, ammonium, calcium, chloride, sulfate, and nitrate ions, at a mountain station to determine their background concentrations. Photometric methods for measuring Cl, SO4, and NO3 ions are described. For determination of the sulfate ion, the sample solution is liberated from all interfering metal ions with a strongly acid cation exchanger. The SO4 ions are then converted to BaSO4 with a defined Ba cation surplus in acid acetone containing medium. The nonconsumed Ba cations liberate an equivalent quantity of copper cations from the copper complex of the ethylene diamine tetraacetic acid in strongly ammoniacal solution. The Cu cations react with pyridyl azonaphtole, and an intensely red complex is formed. The sulfate concentration can be determined indirectly from the quantity of the applied reagents. The determination of the chloride ions is based on the reaction of mercury cations with iron during which a water soluble complex develops from Cl ions which liberate an equivalent amount of iron ions. For determination of traces of nitrate, they are reduced to nitrite by adding the nitrate solution to titanium hydroxide. After a reaction period of 1-1/2 hours, the reduction is completed.

37032 **APTIC NO. 60010**

Ranfft, K.

ON THE DETERMINATION OF FLUORINE BY GAS CHROMATOGRAPHY. *(Zur gas-chromatographischen Bestimmung des Fluors). Text in German. Fresenius Z. Anal. Chem., 269(1):18-21, 1974. 4 refs.*

A fast, simple, and accurate gas-chromatographic method for determination of fluorine in inorganic and organic substances is described. After dry ashing the fluorine reacts with triethylchlorsilane to triethylfluorisilane. The latter is determined by gas chromatography. The accuracy of the method is about + or 2%.

37033 **APTIC NO. 59611**

Rasmussen, R. A., H. H. Westberg, and M. Holdren

NEED FOR STANDARD REFEREE GC METHODS IN ATMOSPHERIC HYDROCARBON ANALYSES. *J. Chromatographic Sci., 12(2):80-84, Feb. 1974. 9 refs. (Presented at the Summer Symposium on Analytical Chemistry, 26th Annual, June 1973.)*

Available gas chromatographic techniques for the analysis of atmospheric hydrocarbons are reviewed in relation to the need for a standard referee method for such analyses. A column type apparatus which has excellent separation of the C2-C5 hydrocarbon fraction of the atmosphere utilizes a packed capillary column. The specific column is 20 ft, 1/16 in od, 0.03 in id, packed with Durapak (n-octane/Porasil C). The device is operated with a flow of seven ml/min helium and is programmed from minus 70 to 60 C at 16 C/min. Subambient temperature programmed analysis of these light hydrocarbons improves both peak resolution and peak shape. Intermediate hydrocarbons have been successfully analyzed with a 200 ft OV-101 SCOT column, although its resolution does not provide for complete separation of the multitude of alkylbenzenes potentially present in heavily polluted atmospheres. Alternate liquid support phases with more specific interactions with polyalkylbenzenes for greater resolution of these hydrocarbons are needed. The SCOT columns appear to have all of the advantages of open tubular and packed columns without the high pressure drop of packed columns or the low sample capacity of capillary WCOT columns. Response versus temperature profiles are provided for the columns discussed.

37034 **APTIC NO. 59360**

Rauh, W. and K. Hammje

HYDROGEN CYANIDE DETERMINATION IN ATMOSPHERIC AIR BY THE PYRIDINE-BARBITURIC ACID METHOD. *(Die Bestimmung von Zyanwasserstoff in der atmosphaerischen Luft nach dem Pyridin-Barbitursaeure-Verfahren). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(3):157-159, 1974. 27 refs.*

Of the various methods (colorimetric and fluorometric methods) available for the determination of trace substances of hydrogen cyanide, the pyridine-barbituric acid method proved very suitable since it is sufficiently sensitive (detection limit 0.02 micrograms HCN per 10 ml) and other pollutants do not interfere. For sampling, 30 ml impingers are used filled with 10 ml 0.1 sodium hydroxide. Through numerous experiments at which the doses of the reagents and the waiting periods were changed, the following optimum reagent doses and waiting times per 10 ml cyanide containing 0.1n NaOH were obtained: 2.2 ml 0.5n HCl, 0.5 ml chloramine-T-solution, 5 to 7 min waiting period, 2.0 ml pyridine-barbituric reagent 10 to 30 min waiting time to photometric determination.

37035 **APTIC NO. 59324**

Schotland, Richard M.

ERRORS IN THE LIDAR MEASUREMENT OF ATMOSPHERIC GASES BY DIFFERENTIAL ABSORPTION. *J. Appl. Meteorol., 13(1):71-77, Feb. 1974. 25 refs.*

An analysis is presented of the lidar measurement of the distribution of atmospheric gases by the differential absorption of scattered energy. The error involved in the measurement of the spatial distribution of the gas density is investigated in terms of the uncertainties associated with the absorption coefficient, the power measurement, the atmospheric parameters, and the laser frequency. An application of the error analysis is made to the measurement of the density of water vapor by a ruby lidar tuned to the 694.38-nm line of water vapor. The uncertainty in the measurement of water vapor is governed by instabilities in the laser frequency for observations below 2 km. At greater altitudes, the uncertainty in the measurement of the density arises from the variance associated with the power measurement. The fractional standard deviation of the water vapor measurement is less than 6% for altitudes below 3 km for the distribution of water vapor studied. (Author abstract)

37036 **APTIC NO. 59847**

Schuetz, Herbert

A NEW COMBINED INFRARED ANALYZER. *(Ein neues kombiniertes Infrarot-Messgeraet). Text in German. Automobiltech. Z. (Stuttgart), 76(2):41-43, 1974.*

A new combined carbon monoxide/hydrocarbons analyzer for automobile exhausts is described and illustrated. The analyzer has two infrared radiators whose infrared radiation is periodically interrupted by a rotating chopper. The copper is followed by the CO measurement cuvette which is divided into the analyzing chamber and the comparison chamber. Behind this cuvette is the CO receiver which absorbs only the wavelength belonging to CO. The entire remaining radiation enters the measurement and comparison cuvette for hydrocarbons. The wavelength belonging to the HC is absorbed in the following HC receiver. Between CO receiver and HC cuvette is an optical filter which passes only wavelengths required for the HC measurements. The measurement range of 0 to 5 vol% CO can be switched to zero to 10 vol% and from 0 to 1000 ppm C6H14 to 0 to 2000 ppm C6H14, the error margin is plus or minus 3%, the auxiliary power required is 220/110 V, 50/60 Hz, the admissible ambient temperature is 0 to 50 C.

37037 **APTIC NO. 59609**

Seeley, J. L. and R. K. Skogerboe

COMBINED SAMPLING-ANALYSIS METHOD FOR THE DETERMINATION OF TRACE ELEMENTS IN ATMOSPHERIC PARTICULATES. *Anal. Chem., 46(3):415-421, March 1974. 32 refs.*

A combined sampling-analysis method for the determination of trace elements in atmospheric particulates has been developed which utilizes spectroscopic graphite electrodes as filters and direct analysis by an emission spectrographic method. The graphite filters used were porous cup spectrographic electrodes (Ultra Carbon, No. 202) which were solution-doped with 0.25 micrograms of indium as an internal standard. Ineffective vaporization of elements deposited in the lower half of the collection cups was overcome by a vaporization approach whereby argon entered the bottom of an electrode cup which was essentially saturated with hydrogen chloride vapor. The graphite cup filters appeared to be more effective for particulate collection than the more commonly used types, and the low blank of the graphite filters readily permitted determinations on small (short-term collection) samples or in low particulate background atmospheres. The method was found capable of determining several trace elements distributed in the atmosphere as particulates at concentrations of less than 0.1 micrograms/cu m (based on a 30 min sample collection) at a collection rate of 1 l/min. The emission spectrographic method allowed simultaneous determination of several elements on a single sample over a wide concentration range with precision and accuracy of 10-20% of the amount present.

37038 **APTIC NO. 59974**

Seki, Naoya and Seiji Suda

AUTOMATIC TESTING SYSTEM WITH MINI-COMPUTER. *(Minikon ni yoru jidoshiken shisutemu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(3):195-199, March 1974. 5 refs.*

With the recent introduction of an inexpensive, high-performance mini-computer capable of performing the three essential functions, data processing, logical judgement, and printout, there is practically no automatic testing system which does not employ the mini-computer for automated measurements of an automotive engine performance. A computerized automatic testing system applied to various performance tests of an automotive engine is described. The basic layout of the test device is shown. The hardware and software are described. Applications of this computerized automatic testing system include bench testing for an electrically-driven automobile, an exhaust gas data processing device, and carburetor flow rate testing.

37039 **APTIC NO. 60253**

Shigeta, Yoshihiro

BAD ODORS -NO. 15-. *(Akushu -no. 15-). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 19(2):55-59, Feb. 1974. 1 ref.*

The injector method of odor measurement (as specified by the American Society of Testing and Materials) is outlined along with some examples of its application. The case of kraft pulping mills is considered in detail. An application of formulas for odor emission rate is given.

37040 **APTIC NO. 59330**

Shilman, Avner

THE ANALYSIS OF TRACE AMOUNTS OF CARBON MONOXIDE. *Environ. Letters, 6(2):149-150, 1974. 2 refs.*

Carbon monoxide in amounts of 1 times 10 to the minus 10th to 5 times 10 to the minus 9th moles have been analyzed for by means of a specially constructed gas chromatograph employing a suitable sampler, molecular sieve column, and a glow discharge detector. The apparatus consisted of two main parts; a sampler, into which the contents of the mixture were transferred and diluted with nitrogen on one atmosphere, and a gas chromatograph, which contained a six-foot column of 5x molecular sieve. The column was specially conditioned by first heating the molecular sieve at 100 C for 2 hr, then introducing it into the column and passing acetone vapor through it for 1 hr. With this treatment CO appears after 5 min at a flow rate of 100 cc/min of N2. The column and the reference column led into a pair of glow discharge detectors, which were constructed from OB-2 vacuum tubes by replacing the external glass cover with a suitable glass envelope with conduit for in and out-flow of gas. The electronic circuit, a high impedance cathode follower, consisted of a simple bridge design.

37041 **APTIC NO. 60260**

Siemer, Duane and Ray Woodriff

APPLICATION OF THE CARBON ROD ATOMIZER TO THE DETERMINATION OF MERCURY IN THE GASEOUS PRODUCTS OF OXYGEN COMBUSTION OF SOLID SAMPLES. *Anal. Chem., 46(4):597-598, April 1974. 5 refs.*

A technique of combining the sensitivity and ease of operation of the carbon rod type of atomizer with the straightforward combustion of organic samples is applied to the determination of mercury in the gaseous products of oxygen combustion of solid samples by atomic absorption spectrometry analysis. The approach involves burning the samples completely in a modified combustion tube, collecting the evolved mercury on the inner surface of a porous, gold-plated, carbon rod atomizer tube, and measuring the atomic absorption when the tube is heated in the normal fashion. Good results can be obtained for a wide variety of organic matrices, including coal samples, and it is possible to burn a series of samples and standards at one time, store the tubes in a desiccator, and analyze them whenever the carbon rod atomizer is not being used for other work. The sensitivity of the technique is 2.0 times 10 to the minus 10 g (1% absorption), and the detection limit is about 1 times 10 to the minus 10 g, comparing favorably with that of neutron activation.

37042 **APTIC NO. 60074**

Takeshita, Isamu

A SULFUR DIOXIDE AND NITROGEN OXIDES CONTROL SYSTEM IN THERMAL POWER PLANT. *(Karyoku puranto ni okeru aryusan gasu, sanka chisso sei-*

gyo shisutemu). Text in Japanese. Otomeshon (Automation), 19(1):65s70, Jan. 1974.

A new process controller for use as a boiler combustion control system is described. It includes a stack gas sulfur dioxide analyzer and a nitrogen oxides measuring apparatus. The SO2 analyzer consists of two parts: an MAG-52 magnetic oxygen meter and a URA-3B infrared gas analyzer. The emission of SO2 is obtained from the product of sulfur concentration and oxygen concentration determined by the oxygen meter. The NOx analyzer is based on the chemiluminescent reaction between ozone and nitric oxide.

37043 **APTIC NO. 59814**

Taniguchi, Naozo

PRESENT STATE AND FUTURE PROBLEMS OF POLLUTION MEASURING INSTRUMENTS. *(Kogai keisokuki no genjo to kongo no kadai). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(4):24-29, April 1974.*

Problems concerning automatic pollution measuring instruments are discussed. Air pollution measuring instruments can be qualitatively classified into three groups. The first group is measuring instruments which are commercially available and provide a high degree of accuracy but require some improvements to reduce frequency of maintenance. This group includes the carbon monoxide analyzer, sulfur dioxide analyzer, and hydrocarbon analyzer. The second group is new to the market and requires more improvement in both accuracy and maintenance. It includes the nitrogen oxides analyzer, dust meter, chlorine analyzer, hydrogen fluoride analyzer, and hydrogen sulfide analyzer. The third group consists of those instruments that must still be developed, and includes a dust meter for emission sources and an odor densitometer. The CO analyzer, the SO2 analyzer for measurement at emission source, the sulfur oxides analyzer for measurement of environmental concentration, the NOx analyzer for measurement at emission source, and the HC analyzer for measurement of environmental concentration are discussed at length.

37044 **APTIC NO. 60221**

Tyson, Bennett J. and Glenn C. Carle

GAS CHROMATOGRAPHIC SEPARATION OF WATER FROM CRYOGENICALLY COLLECTED AIR SAMPLES--ENHANCED CONCENTRATION OF TRACE ORGANIC VOLATILES PRIOR TO GC-MS ANALYSES. *Anal. Chem., 46(4):610-613, April 1974. 8 refs.*

A method for the gas chromatographic separation of water from cryogenically collected air samples containing volatile trace compounds prior to gas chromatographic-mass spectrometric analysis is presented. The preconcentration and analytical system consists of three basic subsystems: a cryogenic preconcentration device, a preparative gas chromatograph with associated transfer valves and collection traps, and a gas chromatographic-mass spectrometric device. The cryogenic traps are heated and purged with helium to remove any residual volatile materials prior to processing the air sample. Tests of the method involving the recovery of hydrocarbon terpenes resulted in better than 83% capture; the recovery of oxygenated terpenes was generally lower but still good, with the exception of bornyl acetate.

37045 **APTIC NO. 60276**

West, Philip W., A. D. Shendrikar, and Nicholas Herrara

THE DETERMINATION OF SULFURIC ACID AEROSOLS. *Anal. Chim. Acta, 69(1):111-116, March 1974. 13 refs.*

A reliable, sensitive, colorimetric method for the determination of sulfuric acid aerosol and alternately the determination of total acidity, including sulfuric acid, volatile acids, and salts that hydrolyze to give protons is presented. The determinations can be performed directly on air samples collected with a sequential tape sampler, and use is made of the inexpensive ring oven for separating and concentrating the samples and reaction products. The basic chemical reactions involved are specifically controlled by protons: stoichiometric amounts of bromine are released from a mixture of bromate-bromide by the protons; and the liberated bromine reacts with fluorescein to produce eosin, the color intensity of which is a direct measure of proton concentration. The detection limit in terms of sulfuric acid is 0.5 microgram with a quantitative measurement range of 1-10 microgram. Relative errors are in the range of 10-15%, comparing favorably with sophisticated and expensive methods at the microgram or nanogram levels. (Author summary modified)

37046 **APTIC NO. 59850**

Wiedner, W., H. Nathansen, G. Thuemmler, and H. Kitke

CONTRIBUTION TO THE MEASUREMENT OF TRACES OF MERCURY IN INDOOR AIR. *(Beitrag zur Messung von Quecksilverspuren in der Raumluft). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(1):4-7, 1974. 15 refs.*

A special cylindrical filter head for the measurement of mercury traces in indoor air was tested. The unit is made entirely of Ekadur and accommodates two filters spaced 5 cm apart. For support of the glass fiber filters, Ekadur sieves were installed. The treatment of the filter paper with about 1% methanolic iodine solution proved advantageous. For testing the efficiency of the filter, it was attached to a sampling set-up comprising three scrubbers. The loaded filters were analyzed after preparation in the laboratory either by photometry with dithizone or by flameless atomic absorption spectrometry for which a specially designed apparatus was used. The described cylindrical filter head was suitable for the determination of mercury in indoor air as well as in technical gases. It permits intake speeds of up to 300 l/hr at a collection efficiency of more than 95%.

37047 **APTIC NO. 60303**

Zolner, William J., Daniel J. Mager, and Denis A. Helm

SOURCE LEVEL SO2 ANALYSIS VIA PULSED FLUORESCENCE. *Preprint, 25p., 1974. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 25th, 1974.)*

A new instrumental method for the analysis of sulfur dioxide in the range 0.5 to 5000 ppm is explained. The method, termed pulsed fluorescence, utilizes the fluorescent emission of SO2 molecules due to their excitation by a short, high intensity, ultraviolet light pulse. Within the instrument, short bursts of ultraviolet light from a long-life flash tube are used to excite the SO2 molecules that have been drawn into a chamber. The SO2 molecules then emit fluorescent radiation in direct proportion to their concentration. This is in turn is detected by a high gain photomultiplier tube and is processed through solid state electronics to be displayed as a direct indication of SO2 concentration in ppm. The advantage of utilizing no consumable gases or chemicals and the inclusion of an automatic calibration feature enable the instrument to operate for long unattended periods. Extended laboratory and field testing has shown that the instrument is linear, fast responding, insensitive to temperature and flow variations of the sample, and interference-free from all gases normally found in combustion products. (Author abstract)

37048 **APTIC NO. 59896**

DETERMINATION OF THE GERM CONCENTRATION OF THE AIR BY THE IMPINGER METHOD. *(Bestimmung des Luftkeimgehaltes, Impingermethode). Text in German. Verpackungs-Rundschau, 25(2):13-16, 1974.*

Instructions are given for the determination of germs (bacteria, yeasts, mold fungi) number of the air by the impinger method. The air to be examined is drawn through an impinger filled with an absorption solution at a rate of at least 600 l/hr for a period which depends on the germ concentration of the air. At least two samples must be taken. Either of two absorption solutions can be used. The standard solution contains 7.8 g peptone from casein tryptically digested, 7.8 g peptone from meat tryptically digested, 2.8 g yeast extract, 5.6 sodium chloride, and 1.0 g D(+)glucose. The second solution contains calf brain infusion, beef heart infusion, proteose peptone, dextrose, sodium chloride and disodium phosphate.

1973

37049 **APTIC NO. 60171**

Austin, Robert R. and Arthur Leonard Vincent

GAS REMOVAL METHOD AND COMPOSITION. *(International Telephone and Telegraph Corp., New York) U. S. Pat. 3,757,488. 3p., Sept. 11, 1973. 1 ref. (Appl. Dec. 5, 1972, 8 claims).*

A selective method of removing sulfur dioxide from flue gases or the like containing both SO2 and hydrogen sulfide without removing the H2S by bubbling the flue gas through 5-95% solution of an organic acid and an alkali metal salt of the acid. The acid is selected from the group of citric malic, lactic, succinic, ascorbic, and tartaric. The acid is preferably citric, and the alkali metal is preferably potassium. The ratio of the weight of the salt to that of the acid may be within the range of about 1:2 to 6:1, since such is needed to make the solution have a pH between 4.0 and 6.0. The ratio is preferably 5:1 moles of salt to acid, the pH is preferably 5.7. This method is especially useful in separating and monitoring SO2 and/or H2S in flue gases such as flue gases from the paper industry. Prior monitoring systems had several disadvantages which are overcome by the new system: prior methods removed only 95% SO2 for a period of 6 hours; the SO2 absorption of prior art solutions was undesirably low; and the H2S rejection was not as good as desired. In this invention, the aqueous solution of a 23% concentration by weight of solid has a life of 8 days during which SO2 absorption is 99.8%; the invention has better H2S rejection than prior art. (Author abstract modified)

37050 **APTIC NO. 59686**

Bakstrom, B. O.

EMISSION MONITORING. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 647-656, 691-697. 13 refs. (May 7-11.)*

Emission monitoring in the pulp and paper industry is discussed and the use of specific monitoring instruments is reviewed. Among the air pollutants, odor is the biggest problem followed by sulfur dioxide and dust. It is necessary to measure both the volumetric flow of the emission and the concentration of the pollutant in the flow because an air pollutant is emitted as a fraction of a larger flow like air or flue gas, which by themselves contain nitrogen, oxygen, carbon dioxide, water, and inert trace gases. Dust emissions are either water soluble dust (mainly sodium sulfate in black liquor recovery boiler flue gases) or nonsoluble dust (mainly calcium sulfate and calcium oxide in calcium spent liquor boiler flue gas and in lime kiln flue gas). Gaseous emissions are either oxidizing sulfur compounds (mainly SO2) or reduced S compounds (mainly hydrogen sulfide, but also organics). The continuous monitors for SO2 that are discussed include: conductometric analyzers, coulometric titrator, photometric analyzer, spectroscopic analyzers, gas chromatography, and electrochemical sensors. Continuous recorders for reduced S compounds include: coulometric analyzers, electrochemical sensors, gas chromatographic analyzers, and tape recorder analyzers. The dust monitors include a tape recorder analyzer and photometric analyzers.

37051 **APTIC NO. 59406**

Barringer, A. R., J. H. Davies, and A. J. Moffat

FURTHER DEVELOPMENTS IN CORRELATION SPECTROSCOPY FOR REMOTE SENSING AIR POLLUTION. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 25-38. 6 refs. (Dec. 10-12, Paper ISA JSP 6658.)*

The majority of gaseous pollutants exhibit optical absorption bands in some portion of the spectrum. If one correlates the absorption spectrum of the gas being measured against a stored replica or mask of that spectrum, quantitative detection is possible. The term correlation spectroscopy has been coined to describe this technique. When natural background radiation is used (for example, ultraviolet and visible radiation from the sky), remote monitoring of certain species such as sulfur dioxide and nitrogen dioxide is possible. One of the principle types of measurements that can be made using the remote sensing spectrometric techniques for pollution monitoring is that of vertical burden measurements. This measurement refers to the amount of gas that lies in a column above a unit area of ground and can be expressed in mg/sq m indicating the mass in mg of the gas which lies in the vertical column of air above a sq m of ground. Measurements of vertical burdens can be made with correlation remote sensors placed in moving vehicles looking vertically upwards. (Author abstract)

37052 **APTIC NO. 59441**

Barringer, Anthony Rene

METHOD AND APPARATUS FOR SENSING SUBSTANCES BY ANALYSIS OF ADSORBED MATTER ASSOCIATED WITH ATMOSPHERIC PARTICULATES. *(Barringer Research Ltd., Ontario (Canada)) U. S. Pat. 3,768,302. 7p., Oct. 30, 1973. 8 refs. (Appl. May 14, 1971, 5 claims).*

A method for sensing substances by analysis of adsorbed matter associated with atmospheric particulates has been developed for thy solution of problems involving the detection of minute quantities of organic or inorganic vapors. The principal feature of the invention is the concept of utilizing the particulates as a carrier for the trace gases and vapors, since the particulates can be readily concentrated and purged of their gas and vapor contents. Two chambers are included for collecting the particulates, and a means is provided for diverting at least a portion of the air stream cyclically between the chambers. A removal means is provided which includes measures for heating at least some of the collected particulates to remove matter in gaseous form. The heating means can be operated cyclically so that while particulates are collected in one chamber, the concentrated particulates in the other chamber are being heated. The chambers are connected to an appropriate analytical instrument.

37053 **APTIC NO. 59929**

Baumgardner, R. E., T. A. Clark, and R. K. Stevens

COMPARISON OF ANALYTICAL METHODS TO MEASURE NITROGEN DIOXIDE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 23p., 1973 (?). 8 refs.*

A chemiluminescent nitric oxide-nitrogen dioxide monitor was compared with existing automated coulometric, colorimetry, and 24-hour manual reference methods for measuring NO2. Correlations were obtained among the various techniques by sampling air in a non-urban atmosphere. In addition, a detailed study of maintenance requirements, calibration stability, and typical response patterns of the instrumental methods was obtained. The lower detectable limit for three of the monitors (coulometric, colorimetric, and Bendix chemiluminescent) was 19 micrograms/cu m (0.01 ppm) NO2. The Thermo Electron chemiluminescent method was slightly more sensitive than the other monitors with a detectable sensitivity of 9 micrograms/cu m (0.005 ppm) of NO2. Response time for the two chemiluminescent monitors was much less than for the coulometric or the colorimetric monitors. The variation of calibration of all instruments was small. The field data taken at Research Triangle Park, N. C., was used to construct a diurnal plot, correlation coefficients, and absolute values. All of the monitors effectively measured non-urban concentrations of NO2. In terms of response time and required maintenance, the chemiluminescent monitors had certain advantages. The Beckman coulometric monitor, while tracking with the other monitors, gave lower absolute values at all concentrations. The Federal 24-hour reference method gave higher absolute values than the continuous monitors at the generally low concentrations observed at the non-urban site.

37054 **APTIC NO. 59412**

Beran, D. W. and F. F. Hall

REMOTE SENSING APPLICATIONS IN AIR POLLUTION METEOROLOGY. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 231-246. 41 refs. (Dec. 10-12, Paper ISA JSP 6700.)*

The application of ground-based remote sensing systems in monitoring those meteorological parameters of importance in urban air pollution is considered. Typical system considerations include an analysis of general and specific site characteristics such as topography, type of effluent, sources, dispersion, climatology, meteorology, zoning, socio-economic factors, total effluent, cost, time factors and technology. Examples of remote sensing systems centered on laser, radar, radiometry, and acoustic methods are presented.

37055 **APTIC NO. 60047**

Bertrand, Raymond

ANALYSIS OF CHLORINATED GASEOUS POLLUTANTS BY CHLORINE-SPECIFIC ELECTRODE. *(Analyse d effluents gazeux chlores par electrode specifique). Text in French. Chim. -Actualites, no. 1519:40-43, Nov. 1973.*

Method for the determination by means of chlorine-specific electrode, of gaseous chlorine components with different degrees of oxidation in waste gases from the destruction of chlorine containing waste gases is described. The chlorine-containing waste gases are absorbed in flushing column with phase separator, after which the solution obtained is reduced by transforming the chlorinated compounds into chlorides by means of 2% solution of ascorbic acid containing 10 g of ferrous alum per liter. The Orion type chlorine-specific electrode is combined with crystalline membrane. Chlorine is determined in the form of the chlorides formed, or in its oxidized form, from the element required for the reduction of the solution. A complete analysis takes a few minutes, and 5 to 10 analyses can be performed hourly. The chlorine concentrations may range from 50 mg to 30 g/cu m.

37056 **APTIC NO. 59254**

Bortner, M. H., R. Dick, H. W. Goldstein, R. N. Grenda, and G. M. Levy

DEVELOPMENT OF A BREADBOARD MODEL CORRELATION INTERFEROMETER FOR THE CARBON MONOXIDE POLLUTION EXPERIMENT. *General Electric Co., Philadelphia, Pa., Valley Forge Space Center, NASA Contract NAS1-10139, 186p., March 1973. 12 refs.*

A breadboard model of a correlation interferometer for a carbon monoxide pollution experiment was designed and fabricated; and laboratory, long-path, and atmospheric tests demonstrated the technique to be a feasible method for obtaining a global carbon monoxide map and a vertical CO profile. The technique is also readily applicable to other trace gases such as methane if minor instrumental changes are made. Carbon monoxide and CH4 data can be obtained with an accuracy of 10% using the technique on a spectral region around 2.3 micron. Outdoor tests showed that the effect of atmospheric amounts of water can be overcome by a proper choice of correlation functions. (Author abstract modified)

37057 **APTIC NO. 59404**

Carlton, D. Thomas

ENERGY DISPERSIVE X-RAY (EDX) SPECTROSCOPY. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 49-51. 3 refs. (Dec. 10-12, Paper ISA JSP 6661.)*

This paper presents first a brief discussion of the basis of x-ray spectroscopy and the traditional wavelength dispersive technique (x-ray diffraction), (WDX), then a discussion of the Energy Dispersive X-ray Spectroscopy (EDX) technique and its advantages, concentrating on its physical chemistry and operational aspects. All unknown elements in the sample are measured simultaneously, thus giving larger counts for a multielement analysis in a shortened time frame. The complex mechanical linkage required by WDX to rotate the crystals and detectors through the angular positions are eliminated by EDX. Since EDX performs elemental analysis on all materials above sodium, it is almost boundless in its application for detecting and analyzing specific environmental pollutants. Detection limits are given for several metals. It is applicable to the analysis of airborne particulates as well as to dissolved or particulate water pollutants. The only consideration must be sound engineering judgements as to the condition of the sample presented to the detector and the most effective tailoring of the instrument variables to yield data that is both valid and useful to the environmentalist.

37058 **APTIC NO. 59401**

Chapman, Robert L.

A STANDARD METHOD FOR EXPRESSING INSTRUMENTAL PERFORMANCE. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 91-94. 11 refs. (Dec. 10-12, Paper ISA JSP 6669.)*

Since pollution is a widespread problem, analytical methods must be standardized in order to obtain comparable data over broad geographic areas. Toward this end, the International Electrotechnical Commission (IEC) is developing a series of recommendations for the expression of functional performance of various types of environmental quality instruments. The basic plan and outline of the prototype document, which is currently under discussion in IEC, is presented here. An expression of the functional performance of nondispersive infrared analyzers used for the continuous determination of air quality is given as an example. (Author abstract modified)

37059 **APTIC NO. 59815**

Collins, S. H. and A. G. Meiering

TELESPECTROMETRY IN THE SERVICE OF ENVIRONMENTAL PROTECTION. *(Tele-Spektrometrie auch im Hinblick auf den Umweltschutz). Text in German. Grundl. Landtech., 23(5):144-146, 1973.*

The possible uses and limitations of remote sensing techniques, such as black and white, color, and infrared photography, multi-spectral scanning, radar, laser, and satellite scanning, in environmental protection are described. Black-and-white photography is able to supply very limited information concerning air and water quality, while color, and especially infrared, photography is used especially for the surveyal of vegetation and water bodies. Multi-spectral scanners are suitable, among other, for the detection of minute temperature differences. Laser techniques, especially such exploiting the Raman effect, are very promising in air pollution studies. It is possible to develop multispectral laser scanners whose wave ranges are selected with respect to specific emissions. Global surveys by means of satellite-borne cameras and multispectral scanners, as being conducted within the framework of the ERTS program, are of special value in the detection and evaluation of anthropogenic effects on the environment.

37060 **APTIC NO. 59556**

Davies, R.

RAPID RESPONSE INSTRUMENTATION FOR PARTICLE SIZE ANALYSES. A REVIEW, PART ONE. *Am. Lab., 5(12):17-18, 20-21, 23, Dec. 1973. 59 refs.*

Instrumentation for the rapid response analysis of sizing of particles is reviewed. The principle of electrical resistance change has found application in the rapid sizing of solid and liquid particles contained in electrically conducting liquids. Two popular devices are the Coulter counter and the ElectroZone Celloscope. Typical count rates of the Coulter counter are 6000 counts/sec, and the size range of application is claimed to be 0.5 to 400 micron. Additional features on the Celluscope include an orifice back flush system to facilitate rapid orifice cleaning; an electronic flow rate system; an internal electronic particle pulse system for control of the electronic assembly; a logarithmic converter system; and a computer interface. Image replication and analysis has had more application in the rapid response sizing of liquid droplets in a gas than any other particle system. Instrumentation and methods include: photographic methods for measuring raindrops in flight; photographic methods for measuring images on film using a photoelectric scanning device; photographic technique for recording small high velocity particles and droplets; a spray droplet analyzer; a raindrop counter that employs a TV scanning screen.

37061 **APTIC NO. 59753**

Foster, J. F., G. H. Beatty, and J. E. Howes, Jr.

FINAL REPORT OF INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION AND ACCURACY OF MEASUREMENTS OF TOTAL SULFATION IN THE ATMOSPHERE USING ASTM METHOD D 2010. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., American Society for Testing and Materials Data Series 55-4, 46p., Oct. 19, 1973. 6 refs.*

A statistical analysis of 79 total sulfation determinations was performed in accordance with the American Society for Testing and Materials Method D 2010. The results indicated that the standard deviation, sb, for variations among single sulfation rate measurements by different laboratories was related to the mean sulfation rate, m, by the expression: sb equals 0.0136 times the square root of m. The mean of the combined measurements between laboratories at all sites was 0.00630 mg/sq cm day, and the overall standard deviation was 0.00135 mg/sq cm day. The standard deviation, sw, for variations among repeated sulfation rate measurements within laboratories was found related to the mean sulfation rate by the expression: sw equals 0.00504 times the square root of m. Overall standard deviation of combined duplicate determinations within laboratories at all sites was 0.00034 mg/sq cm day and was associated with a mean sulfation rate of 0.00630 mg/sq cm day. Sulfate spikes were added to some candles following exposure and prior to the sulfate analysis, and the average recovery of the spikes was 98% based on measurements by all laboratories at all sites. The overall standard deviation of the recovery of the sulfation spikes within laboratories was 21%, while overall standard deviation of the recovery of the sulfation spikes between laboratories was 10%. (Author summary modified)

37062 **APTIC NO. 60313**

Foster, J. F. and G. H. Beatty

INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION AND ACCURACY OF THE MEASUREMENT OF NITROGEN DIOXIDE CONTENT IN THE ATMOSPHERE USING ASTM METHOD D 1607. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., American Society for Testing and Materials Data Series 55-S1, 82p., Sept. 1973. 20 refs.*

An interlaboratory study of eight cooperating laboratories was conducted to determine the accuracy and precision of ASTM Method D 1607 for measuring nitrogen dioxide in the atmosphere. The laboratories performed a total of 704 measurements of NO2 over the concentration range of about 10 to 400 micrograms/cu m (0.005 to 0.2 ppm) in ambient air and spiked ambient air at Los Angeles, Calif., Bloomington, Ind., and Manhattan, N. Y. The NO2 measurements were statistically analyzed. The relationship between the average standard deviation, sb, for variations among single measurements taken by different laboratories (reproducibility) and the mean concentration of NO2, m, was determined. The relationship between the average standard deviation, sw, for variations among repeated measurements within laboratories (repeatability) and the mean concentration, m, was determined. The bias of the measurements of the NO2 recovered from spiked ambient samples was +11, -11, and +35% at Los Angeles, Bloomington, and Manhattan, respectively. A total of 140 correlations including all laboratories, all sites, and all spiked and unspiked samples gave 115 (82%) yield correlation coefficients that were statistically significant at the 95% level. (Author summary modified)

37063 **APTIC NO. 59415**

Frenzen, Paul and Lad L. Prucha

THE WHAT SYSTEM: A NEW DIGITIZED RADIOSONDE AND DOUBLE THEODOLITE BALLOON TRACKING SYSTEM FOR ATMOSPHERIC BOUNDARY LAYER INVESTIGATIONS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 217-221. 2 refs. (Dec. 10-12, Paper ISA JSP 6698.)*

A semiautomatic system for obtaining measurements of wind and temperature through the lower several km of the atmosphere with improved resolution and accuracy has been developed. Two manually-operated theodolites have been equipped with high- resolution, pulse-type shaft encoders directly coupled to the elevation and azimuth axes of each instrument. Associated digital electronic and incremental tape equipment automatically records the four sighting angles in computer-compatible form at preset intervals, as often as once each second. Balloons tracked for winds also carry transistorized radiosonde transmitters whose continuous temperature signals are recorded on the incremental tape along with the tracking data. A computer program subsequently averages several successive sets of sighting angles to smooth operator tracking errors, and calculates average winds, heights, and temperatures (hence the acronym), typically over periods of 10-20 sec or through atmospheric layers 25-50 m thick. The system is fully portable and can be operated with storage batteries in the field. (Author abstract)

37064 **APTIC NO. 59804**

Frukht, I. A. and V. G. El yanov

AIR SAMPLING TECHNIQUES FOR OILY AEROSOL CONTENT DETERMINATION. *(O metodike otbora prob vozdukha dlya analiza soderzhaniya v nem maslyanogo aerozolya). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 10:47-48, 1973.*

The suitability and reliability of vacuum pipettes in oil aerosol sampling especially in machine-tool shops was studied by means of a test equipment composed of a heated marble scale with sulfofresol in a closed space, in connection with a sampler across a venturi tube, and an exhaust fan for vacuumization. A comparison of the oil aerosol contents determined in the samples with the actual loss of sulfofresol in the marble scale at the end of the experiment revealed divergences of 3.8-13% between the measured and calculated quantities. Oil aerosol sampling by means of vacuum pipette is especially recommended for machine-tool shops for instantaneous air sampling under various operating conditions of the machine tool.

37065 **APTIC NO. 59637**

Gallorini, Mario, Nicola Genova, Sandro Meloni, and Vera Maxia

DETERMINATION OF LEAD, MANGANESE, ALUMINUM, AND VANADIUM IN ATMOSPHERIC DUST BY ATOMIC ABSORPTION AND FLAME-EMISSION SPECTROMETRY. *(Determinazione di piombo, manganese, aluminio e vanadio nel pulviscolo atmosferico ad emissione di flamma). Text in Italian. Inquinamento, 15(9):13-16, Nov. 1973. 11 refs.*

A procedure for the determination of lead in atmospheric dust by atomic absorption, and of manganese, aluminum, and vanadium by flame-emission spectroscopy is described. Samples were taken at a suction rate of about 2 cu m/min by means of SS 589 model filter, after which the dust samples were incinerated by the wet method, using hydrochloric acid, hydrofluoric acid, and sulfuric acid for digestion. The rates of recovery for all elements concerned were higher than 97%. Emission spectroscopic analyses were performed by using nitrous oxide-acetylene flame. The aluminum, manganese, and lead contents in different dust samples were in the respective ranges of 9.5-16.7 micrograms/mg; 0.7-4.1 micrograms/mg, and 4.2-9.2 micrograms/mg.

37066 **APTIC NO. 59402**

George, David H. and Karl F. Zeller

VISIBILITY SENSORS IN YOUR AIR QUALITY PROGRAM. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 81-89. 17 refs. (Dec. 10-12, Paper ISA JSP 6668.)*

A status report of visibility sensor technology and application is presented. Sensor development in-progress is outlined and expected results are presented. Visibility data can be used to describe micrometeorologies, predict air pollution episodes, and calculate dispersion. Prevailing visibility, visual range, and sensor equivalent visibility are defined. The visibility sensing techniques light extinction, back, forward and total scattering of light are studied, and basic theory, assumptions, strong points, and weak points of each are examined. The future of visibility sensing is discussed. Most promising for atmospheric applications are infrared and laser backscatter signal analysis. The development of more versatile instruments indicates that one sensor may eventually supply simultaneous information for several program applications. Instrument-sensed visibility may also develop as an index of public air quality awareness. Transmissometers, backscatter, forward scatter, and total scatter instruments (such as nephelometers) are reviewed in terms of cost, efficiency, and ease of operation.

37067 **APTIC NO. 60239**

Ghosh, A. K., D. P. Rajawar, and N. Banerjee

USE OF DETECTOR TUBES FOR QUALITY ASSESSMENT AND CONTROL OF AIR POLLUTANTS--A CRITICAL REVIEW. *Indian J. Environ. Health, 15(2):111-117, April 1973. 16 refs.*

The principles and application of spot detector tubes based on colorimetric reactions of gaseous air pollutants are reviewed in relation to assessment and control of air pollutants. Most of the tubes operate in the threshold limit value ranges and require suitable aspirators for ready use. The volume that can be drawn in or forced into the indicator tubes by these aspirators varies between 50 and 150 cc in a single operation. Two kinds of tubes are available: one type indicating the presence of toxic gas through change in the intensity or shades of color formed and a second type in which the lengthwise spread of color is indicative of the concentration of the toxic gas. The basic constituents for both types are the same; i.e., a suitable sorbent of definite size is impregnated with small but specific amounts of chemicals reactive to the toxic gas. Porous materials which have found use in the preparation of detector tubes are alumina, silica gel, pumic stone, grained firebricks, and porous glass grains. Trace impurities affect the quality, and removal of them by refluxing with nitric acid, calcining, or by solvent washing may be necessary. A particular toxic constituent may be sensitive to several colorimetric reactions, and the choice should fall on stable chemicals having low ambient vapor pressure. Volumes passed through the detector tubes with the squeeze type of aspirator may vary from 5-15% from person to person and within 5% for a number of squeezes by the same person; variance in the diameter of tubes is also of the order of 5-15%.

37068 **APTIC NO. 59405**

Goldstein, Harold W., M. H. Bortner, Robert N. Grenda, Arieh M. Karger, Robert Dick, Frank David, and Peter J. LeBel

THE REMOTE MEASUREMENT OF TRACE ATMOSPHERIC SPECIES BY CORRELATION INTERFEROMETRY. I. CARBON MONOXIDE AND METHANE. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument*

Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 17-19. 5 refs. (Dec. 10-12, Paper ISA JSP 6655.)

A correlation interferometer has been developed for the measurement of carbon monoxide and methane at 2.35 micron in the troposphere and in the stratosphere. This instrument has been tested in laboratory tests, solar-looking outdoor tests, and downward-looking airplane-based tests. The aircraft tests were flown over both polluted and unpolluted regions of North America. The results of these various tests are discussed. Based on the results obtained for CO and CH4, a study was undertaken to investigate the feasibility of measuring other atmospheric trace species by correlation interferometry. Results of the feasibility study for carbon dioxide, water vapor, ammonia, nitrous oxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and several hydrocarbons are presented. (Author abstract)

37069 **APTIC NO. 59416**

Gruber, Arnold H. and E. Karl Bastress

APPLICATION OF THE TRIBOELECTRIC EFFECT TO THE MEASUREMENT OF AIRBORNE PARTICLES. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 161-168. 1 ref. (Dec. 10-12, Paper ISA JSP 6684.)*

The electrical charge transfer process, or triboelectric effect, has been developed as the operating principle for a series of instruments used to measure mass concentration of particulate material under a variety of emission conditions. The charge transfer occurs between particles suspended in a moving gas stream and solid surfaces bounding the stream, and hence, the process can be used to detect the presence of particles in the stream. The instruments which have been developed by IKOR Inc. combine an electronic sensing system based on the charge transfer process with an extractive sampling train to provide truly continuous monitoring of particulate mass flow. The monitor can be calibrated by gravimetric analysis obtained with an integral filter assembly, or by parallel testing with a comparison sampling system. The IKOR instruments are highly effective for sampling and monitoring particulate materials. The instruments also provide a convenient and highly viable technique for maintenance of continuous dust collection equipment. (Author abstract)

37070 **APTIC NO. 59536**

Guagliardo, John Louis

A FEASIBILITY STUDY OF OZONE REMOTE SENSING BY LASER INDUCED INFRARED FLUORESCENCE. *Louisiana State Univ. and Agricultural and Mechanical Coll., Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 73-27,838, May 1973, 178p. 41 refs.*

The fluorescence of ozone induced by its exposure to a carbon dioxide laser was studied. A continuous, tunable carbon dioxide laser was constructed and tested. Analytical parameters involved in developing a procedure for the remote sensing of O3 based on laser induced infrared fluorescence were studied. Then actual remote sensing was tested. The CO2 laser was tunable over the range of 9.2-10.8 micron. It was much more stable than commercial nontunable lasers, but not quite as powerful. Fluorescence was observed for a concentration of about 1% O3 from a 0.6 ml volume. Absolute analytical sensitivity was 70 micrograms of O3. An ozone generator was made, and a procedure was developed to determine the concentration of the O3 generated. The fluorescence intensity was proportional to the laser intensity. Thus, fluorescence intensity would be enhanced by using more powerful lasers. The fluorescence intensity was very sensitive to minor changes in wavelength of the laser beam. This permits selective analysis by measuring the intensity when the laser beam-excited ozone and did not excite ozone. Absorption of radiation by the laser was dependent on the same small changes of laser wavelength. By using more intense lasers, and more sensitive detectors, a remote sensing device for O3 detection could be built. (Author abstract modified)

37071 **APTIC NO. 60203**

Guenther, Karl R.

CARBON DIOXIDE SENSING SYSTEM. *(Bjorksten Research Labs., Inc., Madison, Wis.) U. S. Pat. 3,754,867. 5p., Aug. 28, 1973. 2 refs. (Appl. Sept. 20, 1971, 3 claims).*

A low-cost system for sensing the carbon dioxide content of the ambient air is described. It consists of a thin layer of a chemical which is reversibly absorbent for CO2, the pH of which changes in relation with the amount of absorbed CO2 at any time, and an indicator in the film which changes color in accordance with the pH. A photoelectric system produces an electric signal proportionate to the color change. Substantial independence of humidity is gained by the use of an ionizing solvent having a vapor pressure in the range of 0-10 mm at temperatures up to 150 F as the principal solvent in the thin layer. This solvent is compatible with the other components of the system. This sensor is improved over previous methods. (Author abstract modified)

37072 **APTIC NO. 60110**

Haeberle, Manfred

THE ESTABLISHMENT OF AN ODOR INVENTORY BY THE BASF LUDWIGSHAFEN. ODORS DETERMINED WITH SENSITIVE NOSES. *(Zur Erstellung eines Geruchskatasters der BASF Ludwigshafen. Gerueche erfassen mit feinen Nasen). Text in German. Umwelt (Duesseldorf), 3(6):39-41, June 1973. 8 refs.*

For the establishment of odor inventories, odors were traced on the ground to the point of origin by smell. Because of the particular location of the BASF plant individual odors can be well traced along east or west winds. The odor sensing personnel track the odor in the direction opposite to that of the wind. Odor tracing takes place every day within a certain time period and is usually carried out by two persons in the vicinity of the plant. Random checks are made at night and weekends. Thus, all wind directions and many different weather conditions are covered. The boundaries of one odor can be easily determined by experienced personnel. Maps were drawn of the spread of individual odors. For example, naphthalene emissions, which annoyed the neighborhood for some time, were identified by this method and through proper measures the spread of this odorous substance was reduced by 70%. Further reduction was achieved through afterburning of the waste gas.

37073 **APTIC NO. 59648**

Hanson, Jack Orvel and Robert Martin Ross

APPARATUS FOR MONITORING SUSPENDED AEROSOLS AND PARTICULATES IN GAS. *(General Electric Co., New York) U. S. Pat. 3,744,297. 7p., July 10, 1973. 7 refs. (Appl. Oct. 12, 1971, 4 claims).*

A new apparatus for monitoring suspended aerosols and particulates in gas is described. It consists basically of a filter in a spring-mounted holder, a pump for moving the gas through the filter, a means for causing the filter assembly to oscillate substantially in a horizontal plane, a means for measuring the period of oscillation and for comparing the period measured to the tare period of oscillation, and a means for converting the period difference into an indication of the mass added to the filter during the sampling period. In its preferred embodiment, the apparatus includes means for assuring that the filter and matter collected on it have sufficiently low moisture content during the weighing operation. This method has improved accuracy, simplicity, automation, and cost over prior devices. (Author abstract modified)

37074 **APTIC NO. 60248**

Hashizume, Genzo

USE OF X-RAY IN ENVIRONMENTAL CONTROL ANALYSIS. *(Kankyo kanri bunsiki ni okeru X-sen no riyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 40-46, 1973. 58 refs. (Presented at the Japan Chemical Society X-ray Analysis Conference, 10th, Hiroshima, Japan, Oct. 12-13, 1973.)*

Such x-ray analysis methods as x-ray fluorescence, x-ray diffraction, x-ray microanalysis, and photoelectron spectrochemical analysis (ESCA) are reviewed with regard to their applications to environmental control. X-ray fluorescence is applied to air pollution analysis, water pollution analysis, analysis of river/sea bottom substances, soil contamination, and analysis of sulfur contained in fuel. The x-ray diffraction method has long been used in the field of labor sanitation where it is widely used for qualitative determination of the dust in the working environment in an effort to prevent silicosis and similar occupational diseases. This method is being considered recently for analysis of asbestos, lime, and coke dust in the atmosphere. The recent version of electron probe microanalyzer, an embodiment of the x-ray microanalysis concept, provides numerous data. It is now applied to analysis of environmental pollutants such as powder dust and smoke dust. The ESCA method is also used for analysis of dust, especially for the investigation of chemical state and behavior of the dust in the atmosphere.

37075 **APTIC NO. 59651**

Humphrey, Paul A.

AIR POLLUTION METEOROLOGICAL OBSERVATIONS FOR SHORT-DURATION INVESTIGATIONS, STAGNATION EPISODES AND ACCIDENT EMERGENCIES. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 279-286. 41 refs. (Dec. 10-12, Paper ISA JSP 6704.)*

Attention is directed to the requirements for instruments needed for air pollution meteorological observations during short duration investigations, stagnation episodes, and accident emergencies. The basic requirement is for wind direction and speed observations, with a secondary requirement for vertical temperature profiles and atmospheric stability determinations. Interest is focused in the first 2-3000 ft above the surface, or within the mixing layer during air pollution episodes. Aside from the fact that it is often necessary to make compromises because measurements cannot be made wherever and whenever desired, meteorological instrumentation is available that can provide such information. However, with respect to the design of equipment that can be obtained commercially, there is a need for lighter weight, more compact instruments that are conveniently packaged for transport as baggage aboard passenger aircraft. Also, there is need for instruments more easily set up and operated under difficult field conditions, and that can be calibrated or oriented to satisfy more positively legal requirements that may be encountered during courtroom cross-examinations. Instrumentation including rockets, anemometers, recording systems, balloons, acoustic sounders, radiometers, nephelometers, lidar, and others is discussed.

37076 **APTIC NO. 59373**

Ikezawa, Yoshio, Mikio Murata, Tsutomu Ohata, Yoshikazu Yoshida, and Mashi Matsumoto

COLLECTION EFFICIENCY OF AIR SAMPLING FILTER PAPERS FOR POLYSTYRENE LATEX AEROSOLS. *(Kakushu jinai sanpuringuyo roshi no proisuchiren ratekkusu earozoru ni taisuru hoshu koritsu). Text in Japanese. Hoken Butsuri (J. Japan. Health Phys. Soc.), 8(3): 145-152, 1973. 24 refs.*

The air sampling collection efficiency of nine types of filter paper was determined for monodisperse polystyrene latex aerosols by using a forward light scattering photometer. The aerosols were 0.091, 0.198, 0.365, 0.500, and 1.099 micron in diameter; flow through the filter paper was at a face velocity of 4.2-200 cm/sec. Toyo No. 660, No. 60, and No. LP filter papers exhibited minimum efficiencies at the face velocity range between 10 and 80 cm/sec and in the particle size range between 0.1 and 0.5 micron. The collection efficiencies of Toyo No. 5A and Whatman No. 41 filter papers were over 95% for all of the particle sizes at a face velocity higher than 100 cm/sec. Toyo HE-40, HV-70, Toyo GB-100, and Gelman E filter papers showed collection efficiencies higher than 99%. Theoretical filter efficiency based on single fiber filtering mechanisms and the effect of neighboring fiber interference on the collection efficiency were also examined.

37077 **APTIC NO. 59790**

Imae, Akira

A MEASURING METHOD FOR DUST IN FLUE GAS. *(Endo haigasu-chu no baijinryo sokutei hoho). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 9(11):1133-1138, Nov. 1973.*

In the measurement method for dust in stack gas specified by JIS, the proper collection of dust is the most important point, which means that dust must be collected by uniform suction. In this method, the dust is filtered by a glass wool filter or a filter paper provided in the dust collector. Since the concentration of dust is expressed as the mass of dust in a dry gas, measurement of the moisture content of the stack gas is necessary. The methods for this are the absorption tube method and the condenser method, but in most cases the former method is used. The mass of dust can be obtained from the results of a densitometer as well as from the composition of stack gas. Of all the dust collectors used-- dust tube, round filter paper, and cylindrical filter paper--the round filter paper (pretreated at a temperature above the temperature of the stack gas) is most frequently used because of its small error.

37078 **APTIC NO. 60208**

Iwao, Norito, Akira Ezaki, Shigemi Hayashi, Yukio Nakamori, Keihachiro Tanaka, Nobukuni Nakano, and Toshihito Morita

SAMPLING APPARATUS FOR ANALYZING GAS. *(Nippon Steel Corp., Tokyo (Japan)) U. S. Pat. 3,759,087. 7p., Sept. 18, 1973. (Appl. April 8, 1971, 6 claims).*

A gas sampling apparatus, which is a high temperature dry sampling apparatus, is described which makes it possible to carry out quickly and accurately a stabilized analysis of dust-rich, high temperature, and high humidity gas generated from a gas generating source. Such sources include a shaft furnace, converter, open hearth furnace, and other furnaces. A typical apparatus has a ceramic filter fitted to the tip of a gas outlet pipe provided with a cooling cylinder, a mechanism for blowing gas and for removing dust set near the filter, and a thermal expansion absorbing mechanism installed in the gas outlet pipe. This system is improved over previous wet and so-called dry sampling systems since it can work even in an environment having a high temperature, dust content, and humidity. It reduces the time loss in sampling by setting the sampling apparatus as close as possible to the gas generating source. (Author abstract modified)

37079 **APTIC NO. 60068**

Kato, Tatsuo and Shinji Nakayama

INVESTIGATION OF FACTORY ENVIRONMENT BY GAS CHROMATOGRAPHIC MASS ANALYZER. *(GC-MASS ni yoru kojo kankyo no chosa). Text in Japanese. Preprint, Japan Society for Safety Engineering, Tokyo, p. 103-106, 1973. (Presented at the Safety Engineering Studies Presentation Meeting, 6th, Tokyo, Japan, Dec. 6-7, 1973, Paper 29.)*

A gas chromatographic mass analyzer is compared with a conventional gas chromatograph to analyze the air outside a dye manufacturing plant in Yokohama. Substances detected by the gas chromatographic mass analyzer include isopentane, chloroethylene, n-pentane, 2-methyl pentane, 3-methyl pentane, acetaldehyde, n-hexane, 2-methyl hexane, 3-methyl hexane, methyl alcohol, n-heptane, acetone, dichloromethane, ethyl alcohol, among others. The gas chromatogram of the mass analyzer gives peaks that correlate well with data given by conventional gas chromatography, and more qualitative information is obtained.

37080 **APTIC NO. 60247**

Kobayashi, Yoshitaka

MEASUREMENT BY DETECTOR TUBE METHOD OF HARMFUL GASES IN THE WORKING ENVIRONMENT. *(Kenchikanho ni yoru rodo kankyo no yugaigasu sokutei). Text in Japanese. Rodo Eisei Kogaku (J. Ind. Hyg Japan), no. 13:9-16, 1973. 8 refs.*

A detector tube is a small glass tube measuring 2-4 mm in diameter, densely filled with a suitable detection agent, and sealed at both ends. As a given quantity of sample air is injected into it by means of the special gas sampler, the detector agent of the tube reacts immediately with the specific gases contained in the sample and the concentration of gases is colorimetrically determined. Trace analysis of an air pollutant is possible with this method in which trace quantities of various substances are calculated from the length of the colored part of the detector agent layer. The carrier agents are usually silica gel, active alumina, or granular glass while the detector agents are tetramethyl paradiamino diphenyl methane and iodine for analysis of trace sulfur dioxide; mercuric chloride and methyl orange for hydrogen cyanide; and orthotolidine for nitrogen dioxide. Various factors known to affect accuracy of the detector tube method are discussed. They include grain size of the carrier, quantity of the detector agent, and water content of the detector agent. Feed speed of the sample gas, temperature of the detector tube, presence of an interfering gas, and lapse of time after the tube was manufactured are other factors affecting measuring accuracy. Various detector tubes commercially available are listed

37081 **APTIC NO. 59379**

LaHue, Miles D., Herman D. Axelrod, and James P. Lodge, Jr.

DIRECT MEASUREMENT OF ATMOSPHERIC NITROUS OXIDE IN A STORED AIR VOLUME USING THERMAL CONDUCTIVITY GAS CHROMATOGRAPHY. *J. Chromatographic Sci., vol. 11:585-587, Nov. 1973. 10 refs.*

A method for direct measurement of atmospheric nitrous oxide in a stored air volume using thermal conductivity gas chromatography was developed which eliminates the need for a molecular sieve and has better precision than the electron capture detector. Analysis is performed on a Perkin-Elmer Model 900 gas chromatograph equipped with a thermal conductivity detector and a filament protection circuit. A Valco eight-port gas sampling valve is used to transfer the samples onto the chromatograph columns, and a Brooks model 8744 flow controller adjusts the flow rate of the sample flush gas. The stripper and analytical columns are preconditioned with helium flow at 350 C, and a scrubber column for water and carbon dioxide removal is inserted ahead of the sampling valve. The container is placed into the system for sample transfer with the sampling valve in its appropriate position, and the cylinder is flushed with a 400 cc/min He flow rate for 20 min. The He stream carries the air sample through the scrubber column for removal of water and carbon dioxide and onto the stripper column where the N2O is retained while the main constituents, oxygen and nitrogen, are vented to the atmosphere. Both the stripper and analytical columns are maintained at 30 C during these steps. The stripper column is placed in series with the analytical column after the 20 min flush by switching the position of the gas sampling valve. The temperature of both columns is raised immediately to 210 C, and the sample passes from the stripper column onto the analytical column where it is further separated from any residual air and CO2. The N2O peak elutes in approximately 7 min at an He flow rate of 25 cc/min, and the peak area is subsequently determined from the chart recording. The column is baked out at 300 C for 5 min between each run.

37082 **APTIC NO. 59382**

Langan, Lee and Andrew J. Moffat

THE APPLICATION OF THE CORRELATION SPECTROMETER TO AMBIENT AIR QUALITY AND SOURCE EMISSIONS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 117-124. 12 refs. (Dec. 10-12, Paper ISA JSP 6673.)*

The applications of the correlation spectrometer, designed as a remote sensor to measure the content of sulfur dioxide and/or nitrogen dioxide in the open air, have been expanded and compared to other measurement methods for verification of the results. Data accumulated between 1971 and 1973 are used to depict the use of this remote sensor for developing an emission inventory, for describing the distribution of gases and their relationship to ground level concentrations and as an open-path ambient monitor. (Author abstract)

37083 **APTIC NO. 59922**

Lengelle, G. and C. Verdier

GAS SAMPLING AND ANALYSIS IN COMBUSTION PHENOMENA. *Office National d Etudes et de Recherches Aerospatiales, Chatillio-sous-Bagneux (France), North Atlantic Treaty Organization Advisory Group for Aerospace Research and Development Rept. AGARD-AG-168, 184p., July 1973. 224 refs.*

NTIS, DDC: AD 766913

Gas sampling and analysis considerations are reviewed for combustion phenomena. Topics covered include: the utilization of gas analysis in combustion chambers; gas analysis for the determination of combustion kinetics fundamental data; problems raised by the sampling of gases; and methods of gas analysis (gas-phase chromatography, nuclear magnetic resonance, mass spectrometry, infrared, ultraviolet, and Raman spectrometry, chemical analysis methods, and various physico-chemical methods including colorimetry, electrochemical, and chemiluminescence).

37084 **APTIC NO. 60157**

Mamuro, Testuo, Yatsuka Matsuda, and Akira Mizohata

MULTIELEMENT ANALYSIS OF AIRBORNE DUST BY INSTRUMENTAL NAA AND ENERGY DISPERSIVE FXA. *(Kikiteki hosaka bunseki to enerugi bunsangata keiko X-sen bunseki no heiyo ni yoru taiki fuyujin no hihakaiteki tagenso bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):536, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 263.)*

The combined use of instrumental neutron activation analysis (INAA) and energy dispersive fluorescent x-ray analysis makes it possible to increase tremendously the number of elements which can be analyzed in suspended particulates. Because fluorescent x-ray covers a number of elements usually undetectable by radioactive analysis, the sensitivity, reliability, and selectivity are all greatly improved. Also, the measurements of elements that can be analyzed by either method can be checked against each other for accuracy.

37085 **APTIC NO. 60030**

Mang, Oswald Karl Clarence

ATMOSPHERIC CHLORINE DETECTION APPARATUS. *(Assignee not given.) U. S. Pat. 3,761 377. 6p., Sept. 25, 1973. 10 refs. (Appl. April 4, 1972, 10 claims).*

A method is described for detecting an electronegative gas such as chlorine by passing the gaseous mixture through an aqueous electrolyte across the surfaces of two electrodes in the direction from the first electrode to the second. The electrodes are externally connected by a current detection circuit. The gaseous mixture is then passed across the second electrode; the electronegative gas component dissolves in the electrolyte with the formation of negative ions which cause a current to flow through the current detection circuit. The apparatus filters dust and other floating impurities from the detection cell. (Author abstract modified)

37086 **APTIC NO. 59863**

Manka, Dan Paul

GAS SAMPLING APPARATUS. *(Jones and Laughlin Steel Corp., Pittsburgh, Pa.) U. S. Pat. 3,748,906. 6p., July 31, 1973. 2 refs. (Appl. Oct. 15, 1970, 4 claims).*

A gas sampling apparatus for sampling a dirt- and moisture-laden gas stream, such as blast furnace top gas, for cleaning the gas, and for delivering it to a gas analyzer is described which employs parallel sampling probes and associated filter units to permit continuous alternate sampling and cleaning of the filters by back-flushing. The apparatus automatically ceases sampling whenever a foreign gas is introduced into the gas stream being sampled. This invention allows dirt and moisture-laden gas to be sampled continuously, without separate steps for cleaning the gas prior to analysis. In addition, transient conditions which might normally cause the sampling to be discontinued to prevent damage to the sampling and analyzing apparatus or for other reasons, are dealt with so that sampling can be continuous. (Author abstract modified)

37087 **APTIC NO. 59366**

Marich, Yu. V.

ASSAY OF DINILE IN AMBIENT AIR. *(Opredeleniye dinila v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 12:103-105, 1973. 3 refs.*

A colorimetric method for the determination of small concentrations of dinile (succinonitrile; ethyl cyanide) in the presence of benzene in the air is described. Nitrodinile in toluene is combined with acetone and sodium sulfide, after which 25 to 60 l of air are sampled through an absorber containing potassium nitrate and strong sulfuric acid. Sodium sulfate is added for the destruction of oxidants. Benzene and its homologs are oxidized by means of potassium dichromate. Following extraction with toluene, the extract is combined with sodium carbonate solution. The extract, containing nitro derivatives of dinile as well as metadinitrobenzene, is combined with sodium sulfide, and is acidified with acetic acid to obtain a yellow color which is then determined photometrically.

37088 **APTIC NO. 59984**

Matsushita, Hidetsuru

FLUORESCENCE ANALYSIS METHOD. *(Keiko bunsekiho). Text in Japanese. Rodo Eisei Kogaku (J. Ind. Hyg. Japan), no. 13:21-27, 1973. 12 refs.*

All aspects of the fluorescence analysis method ranging from its principle to general performance characteristics to actual application are discussed. Fluorescence analysis makes use of the photoluminescence phenomenon of a substance for qualitative and quantitative determinations. In this method, an ultraviolet or visible ray of a suitable wavelength is applied to a given sample and required qualitative and quantitative determinations are made by measuring the spectrum and intensity of the fluorescence emitted from the sample. The sample may be a gas, a liquid, in an adsorbed state, a solid solution, or a solid. However, samples in liquid form are most widely used for this analysis because the wavelength of fluorescence ranges between 200 and 650 micron. The advantages of this method include high detection sensitivity, high selectivity, and greater capability of analyzing mixed samples, while the disadvantages are inability of analyzing a substance emitting no fluorescence, reproducibility inferior to that of colorimetric method, and interference by temperature, pH, and concentration. The fluorescence analysis instruments including fluorescence photometer and spectrophotofluorometer are described. The analysis procedures, together with precautionary remarks on the solvent, pH, viscosity, suspending solids, Raman ray, photolysis, temperature, concentration, dissolved oxygen, slit width, and secondary ray, are fully discussed.

37089 **APTIC NO. 59619**

McCrone, Walter C.

ULTRAMICROANALYTICAL TOOLS FOR PARTICULATE POLLUTANTS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 205-210. 2 refs. (Dec. 10-12, Paper ISA JSP 6694.)*

The successful identification of particulate pollutants requires specialized tools and techniques for sampling, fractionation, manipulation, and characterization. The integration of these techniques enables the microscopist to identify almost any single inorganic particle larger than 10 to the -15th g, although organic particles must usually be considerably larger. Sampling tools and procedures are briefly discussed. Manipulative tools considered include tungsten needles, polyethylene needles, microdroplets of liquid, micropaintbrushes, and polyethylene pipettes. A discussion of characterization and identification deals with chemical properties, physical properties, and crystallography. Ultramicroanalytical tools discussed include the polarizing microscope, scanning electron microscope, transmission electron microscope, x-ray diffraction, electron microprobe analyzer, ion mass spectrometry microprobe, electron microscope-microprobe analyzer, and photoelectron spectroscopy.

37090 **APTIC NO. 59403**

Melfi, S. H.

STANDARD METHODS FOR ANALYSIS AND INTERPRETATION OF LIDAR DATA FOR ENVIRONMENTAL MONITORING. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 73-79. 5 refs. (Dec. 10-12, Paper ISA JSP 6667.)*

The versatility and usefulness of lidar as a technique is remotely monitoring the atmosphere is noted. Standard methods of data analysis have been proposed for aerosol, visibility, and molecular concentration measurements. These standard techniques rely heavily on Raman nitrogen scattering at short ranges and modeling of the expected molecular lidar return at greater ranges. Standard methods of data treatment are necessary both for intercomparison of data between lidar research groups and to facilitate various users concerned with the results of lidar observations. Further advances of lidar application can be expected because of advances in laser and photo-detector technology. The advanced techniques expected in the future include differential absorption and fluorescence measurements of molecular concentrations. As these applications of lidar progress, monitoring of ambient pollutant concentrations may become practical. (Author summary)

37091 **APTIC NO. 59606**

Mitsugi, Hidekatsu, Yoshihiro Nakagawa, and Nobuhiro Takata

DETERMINATION OF HEAVY ELEMENTS IN SUSPENDED PARTICULATES BY FLUORESCENT X-RAY SPECTROMETRY-QUANTITATIVE ANALYSIS OF V, CR, MN, NI, CU, AS, BR, MO, CD, SN, SB, AND PB BY USING BRIQUET METHOD. *(Keiko X-senho ni yoru fuyu ryushijo busshitsuchu jugenso no bunseki--buriketto-ho ni yoru V, Cr, Mn, Ni, Cu, As, Br, Mo, Cd, Sn, Sb, Pb no teiryo). Text in Japanese. Hyogo-Ken Kogai Kenkyusho Kenkyu Hokoku (Rept. Public Nuisance Res. Inst. Hyogo Prefect.), no. 5:1-6, 1973. 16 refs.*

X-ray fluorescent spectrometry was used for the simultaneous determination of heavy elements in suspended particulates which were collected on a glass fiber filter molded into a briquet form. The method allowed for more sensitivity and facility in standard sample preparation as compared to the filter paper method; calibration curves were obtained by using the intensity ratio of scattered background to characteristic x-rays for correction of the matrix effect. Detection limits calculated for continuous air sampling for a month at the rate of 20 l/min, using a low volume air sampler, were: 0.002 micrograms/cu m for manganese, nickel, copper, and arsenic; 0.004 micrograms/cu m for bromine, molybdenum, cadmium, and tin; 0.006 micrograms/cu m for vanadium and lead; 0.009 micrograms/cu m for chromium; and 0.013 micrograms/cu m antimony.

37092 **APTIC NO. 60235**

Mitsugi, Hidekatsu, Yoshihiro Nakagawa, Tomiki Kobayashi, Nobuhiro Takada, and Genzo Hashizume

DETERMINATION BY FLUORESCENCE X-RAY METHOD OF HEAVY ELEMENTS IN ENVIRONMENTAL ATMOSPHERE. *(Keiko X-sen ho ni yoru kankyo taikichu jugenso no teiryo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 18-19, 1973. (Presented at the Japan Chemical Society X-ray Analysis Conference, 10th, Hiroshima, Japan, Oct. 12- 13, 1973.)*

Atomic absorption analysis and other analytical methods used to analyze heavy metal contents of the atmosphere require a chemical pre-treatment of the sample before the analysis, and there is no way to guarantee that the sample has been completely pretreated. Fluorescent x-ray analysis is applied to quantitative determinations of heavy elements in the atmosphere including vanadium, manganese, nickel, copper, arsenic, bromine, molybdenum, cadmium, tin, antimony, and lead. The sample, collected by a high or low-volume sampler using a glass fiber filter, was ground together with the filter and mixed. About 0.6 g of this mixture was briquetted. Using this sample, x-ray fluorescence examined the detectable limits of these heavy elements, tested a compensation method for the matrix effect, and provided a comparison with the atomic absorption analysis method. The optimum thickness of the sample for this analysis was 2.2 cm diameter. Since the glass fiber filter used as mainly composed of such light elements as silicon and sodium, the matrix effect was compensated for by the method based on the intensity ratio between the characteristic x-ray and the background scattering rays. The calibration curve for each element analyzed showed a good linearity in the range of 0-100 or 0-500 ug/g. Compared with the atomic absorption method, there was no significant difference in the measured results between this method and the atomic absorption method.

37093 **APTIC NO. 59913**

Nakahara, Shojiro

LASER RADAR FOR FLUE GAS MONITORING. *(Haien kanshiyo reza reda). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 40(1):1169-1176, 1973. 7 refs.*

A general discussion is given for flue gas monitoring by laser raman radar. Molecules show specific raman shift when light is irradiated and scattered. Gas concentrations can be determined by measuring the quantity of scattering light at certain raman shift after light with a given wavelength is irradiated. The light source and detection method are the two most important factors to increase the sensitivity since raman scattering is a very weak phenomenon. Monochromatic light with short wavelength is required for providing satisfactory results. In flue gas which has a much higher carbon dioxide concentration than sulfur dioxide, the side band of the scattering light of the former interferes with that of of the latter.

37094 **APTIC NO. 59414**

Novakov, T.

CHEMICAL CHARACTERIZATION OF ATMOSPHERIC POLLUTION PARTICULATES BY PHOTOELECTRON SPECTROSCOPY. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 197-204. 16 refs. (Dec. 10-12, Paper ISA JSP 6693.)*

A discussion is presented of the application of X-ray photoelectron spectroscopy (also known as ESCA or XPS) to the chemical characterization of pollution particulates, in particular to the determination of concentrations and chemical states of sulfur, nitrogen, and carbon. In addition to the discussion of the capabilities of ESCA as an analytical tool, a short summary of the application of the method to a more comprehensive study of the formation and behavior of urban sulfates is presented. (Author abstract)

37095 **APTIC NO. 59493**

Nelson, J. W., I. Williams, T. B. Johansson, R. E. Van Grieken, K. R. Chapman, and J. W. Winchester

ELEMENTAL ANALYSIS OF AEROSOLS USING PROTON SCATTERING. *Proc. IEEE (Inst. Elec. Electron Engrs.), 1973:1-11, Nov. 1973. (Presented at the Nuclear Science Symposium.)*

Proton scattering appears to be a useful tool for quantitative elemental analysis of aerosols and other thin samples. The method is absolute and nondestructive, and a complete broad range analysis for all elements can be performed using proton scattering up to chlorine and proton induced x-ray fluorescence for those elements heavier than chlorine. Calibration is accomplished by measurement of yields of scattered protons from samples of previously determined density, and relative calibrations for various elements may be determined using the stoichiometric ratios for various compounds. A significant desirable feature of proton scattering is that no correction for absorption in thin layers of the sample material is needed; too thick a sample results in an immediately recognizable loss in spectral energy resolution. Spectra of air particulate matter are presented for both a total filter (Nuclepore) and a size fractionated air impactor (polystyrene backed) sample.

37096 **APTIC NO. 60227**

Ogita, Haruhisa, Takenori Kodama, and Kazumaro Ishida

ISOTOPE COMPOSITION OF SULFUR IN ATMOSPHERIC SULFUR DIOXIDE GASES. *(Taikichu no aryusan gasu no iou no doitai sosei ni tsuite). Text in Japanese. Aichi-ken Kogai Chosa Senta Shoho (Rept. Environ. Pollut. Res. Cent., Aichi Pref.), no. 1:34-39, March 1973. 5 refs.*

Variations among isotopes of sulfur are conventionally indicated quantitatively by a delta value, described as delta S35, which is calculated from the ratio of S34 (S of 34 atomic weight) to S32, compared to that of a standard substance. Delta values were determined for samples obtained from air and rain in Aichi Prefecture in order to utilize the delta concept for detection and classification of sulfur in pollutants. Practical application of this idea was difficult because of the small variation in the delta values within the limited area.

37097 **APTIC NO. 60233**

Oikawa, Kikuo

APPLICATION OF X-RAY DIFFRACTION TO ANALYSIS OF ENVIRONMENTAL POLLUTION. *(Kankyo osen bunseki ni okeru X-sen kaisetsu no oyo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 11-16, 1973. 8 refs. (Presented at the Japan Chemical Society X-ray Analysis Conference, 10th, Hiroshima, Japan, Oct. 12-13, 1973.)*

Metal contents in environmental pollutants are presently analyzed by methods such as atomic absorption spectrophotometry, spectrometry, x-ray analysis, radiochemical analysis, and others. There are a number of reports dealing with analysis of metal contents in the atmosphere but they invariably give the amount of each metal contained in the atmosphere as such, but not the state or form in which the metals actually exist in the atmosphere. When determining their effects on the environment, especially on humans, it is important to know their physical and chemical behaviors in the atmosphere. Analysis designed to clarify the phase and coordination characteristics of the atmospheric metals is extremely important for the factual analysis of air pollution mechanisms. For example, toxicity of manganese sulfate is said to be about 100 times stronger than that of manganese dioxide. Suspended substances in the atmosphere were analyzed by x-ray diffraction, using the samples collected by high-volume samplers at several locations in Kawasaki, one of the major industrial districts in Japan. There are a great number of substances formed by reactions of SO2 and SO3 with salts of calcium in the atmosphere. The quantitative phase analysis is described in detail.

37098 **APTIC NO. 59621**

Parry, H. Dean

A REMOTE SENSOR OF ATMOSPHERIC TEMPERATURE PROFILES USEABLE UNDER ALL AIR POLLUTION CONDITIONS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 151-153. (Dec. 10-12, Paper ISA JSP 6679.)*

The RASS (Radio Acoustic Sounding System) continuously measures the temperature profile of the atmospheric layer extending from the ground to about 1 km. It penetrates clouds, heavy pollution, rain, snow, and low level inversions. The only meteorological element which severely restricts the height to which the system will work is strong wind at or above the ground. The fundamental concept employed in RASS is the tracking of sound pulses by means of electromagnetic radar. Some of the principles of this are discussed. The physical system is briefly described and some sample temperature profiles measured by the system are given and discussed.

37099 **APTIC NO. 59620**

Perkins, Porter J. and Gregory M. Reck

ATMOSPHERIC CONSTITUENT MEASUREMENTS USING COMMERCIAL 747 AIRLINERS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 309-318. 11 refs. (Dec. 10-12, Paper ISA JSP 6712.)*

National Aeronautics and Space Administration is implementing a Global Atmospheric Monitoring Program to measure the temporal and spatial distribution of particulate and gaseous constitutents related to aircraft engine emissions in the upper troposphere and lower stratosphere (6-12 km). Several 747 aircraft operated by different airlines flying routes selected for maximum world coverage will be instrumented. The initial design of the system (location of equipment, aircraft interfaces) was conceptually defined in feasibility studies conducted by several airlines and an airframe company. An instrumentation system, including an ultraviolet absorption ozone monitor, aluminum oxide hygrometer, fluorescent carbon monoxide monitor, and light-scattering particle counter, is now being assembled and tested and is scheduled for operation in airline service in late 1974. Specialized instrumentation and an electronic control unit are required for automatic unattended operation on commercial airliners. An ambient air sampling system was developed to provide undisturbed outside air to the instruments in the pressurized aircraft cabin. The data system has a flight data acquisition unit and tape recorder used in late model airliners. The inertial navigation system and air data system available on the newer jets will record the location and time of the atmospheric measurement as well as meteorological information such as wind speed and direction and air temperature. (Author abstract)

37100 **APTIC NO. 59371**

Podol skiy, A. A. and L. I. Kalakutskiy

ON THE INFLUENCE OF THE PARTICLE SHAPE ON THE ERROR IN THE MEASUREMENT OF THE AEROSOL PARTICLE SIZE DISTRIBUTION BY THE ELECTROPRECIPITATION METHOD. *(O vliyanii formy chastits na pogreshnost izmereniya dispersnogo sostava aerozolya elektropretsipitatsionnym sposobom). Text in Russian. Kolloidn. Zh., 35(6):1188-1190, 1973. 11 refs.*

The dependence of the dimensionless precipitation coordinate of charged conducting revolution ellipsoids moving laminarly in a plane condenser of the semi-axis ratio was calculated. The assumed charge is supposed to be proportional to the particle surface. The precipitation coordinate was dependent on such factors as the dynamic viscosity of the medium, the equatorial semi-axis of the ellipsoid, a coeffient, determined by the ellipsoid shape and of the semi-axis ratio, the particle charge, as well as the field potential. The precipitation coordinate was weakly dependent of the semi-axis ratio only for flattened ellipsoids with equal surface. The dispersion in the precipitation coordinates of particles of equal volume may, however, exceed 50% of the absolute value.

37101 **APTIC NO. 60024**

Rennie, John Coyne

COORDINATED PRECISE POSITION POLLUTION DETECTING. *(Assignee not given.) U. S. Pat. 3,751,984. 6p., Aug. 14, 1973. 5 refs. (Appl. June 5, 1970, 4 claims).*

A system is described for guiding an aircraft in point to point flight while collecting pollutant data from large bodies of water or air. Environmental pollutant data is recorded concurrently with aircraft positional data to provide an exact pollution profile for determining source, type, and point to point levels. The system includes a navigational sensor, a computer, and command displays. No overall system for the rapid and automatic collection of pollutant and positional data previous existed. (Author abstract modified)

37102 **APTIC NO. 60017**

Resch, W., J. Schedling, J. Waniek, H. Flamm, and M. Rotter

COLLECTION OF AIRBORNE BACTERIA BY AN AUTOMATIC SAMPLER. *(Vollautomatische Sammlung von Luftkeimen mittels eines Filtergeraetes). Text in German. Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig., 158(2):206-218, 1973. 77 refs.*

A device that samples airborne bacteria by filtration of air through gelatin filters is described. Either the number of particles carrying bacteria or the total number of viable bacteria may be estimated. The device consists of filter-holders, a gasmeter, a camera, and a pump. The sampler has bee used successfully for monitoring the number of airborne bacteria in hospitals.

37103 **APTIC NO. 59353**

Riggs, R. Kent

AIR SAMPLING DEVICE. *(National-Southwire Aluminum Co., Carrollton, Ga.) U. S. Pat. 3,765,247. 6p., Oct. 16, 1973. 5 refs. (Appl. Oct. 22, 1971, 7 claims).*

An air sampling device for obtaining samples from aluminum reduction plant atmospheres where determination of dust and other particulates is required has been developed to operate without the aid of an electrically-powered vacuum pump, thus eliminating flow rate variations encountered in prior art devices as a reult of the effect of magnetic fields generated during reduction operations. The device operates solely by compressed air which is conducted through a venturi tube and creates a region of reduced pressure for drawing ambient air into the device. Particles or gases are trapped in a filter for analysis. The device includes a manifold which has several fittings, each adapted to receive individual sample-collecting chambers so that several samples may be taken consecutively. (Author abstract modified)

37104 **APTIC NO. 59809**

Roth, M. J. and D. Rouyer

NITROGEN OXIDES AND AUTOMOBILE TRAFFIC-GENERATED AIR POLLUTION. *(Oxydes d azote et pollution automobile). Text in French. Pollut. Atmos. (Paris), 15(60):383-390, Oct.-Dec. 1973. 14 refs.*

Conditions of the formation, and analytical methods available for the measurement of nitrogen oxides emitted by motor vehicles are described. Nitric oxide is formed at high combustion engine temperature at air excess coefficients close to unit. The rate of NO formation is rather low at low and high air excess coefficients. The NO emission can be abated by the use of materials facilitating heat pumping from the engine, by recirculating up to 15% of the exhaust gas, and possibly by the evaporation of water inside the cylinders. The modified Jacobs Hochheiser colorimetric method, the ultraviolet absorption method, and a chemiluminescent method with preliminary conversion of nitrogen dioxide to NO were used for exhaust gas NOx measurements under different operating conditions in a dynamometer stand according to the European cycle. The chemiluminescent method, being suitable for NO determination at high temperature, is of special interest for analyses in the European cycle. Rapid conversion of NO into NO2 in the plastic bag used for exhaust gas sampling was observed.

37105 **APTIC NO. 59381**

Seals, R. K., Jr. and Clayton H. Bair

ANALYSIS OF LASER DIFFERENTIAL ABSORPTION REMOTE SENSING USING DIFFUSION REFLECTION FROM THE EARTH. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 131-137. 10 refs. (Dec. 10-12, Paper ISA JSP 6675.)*

A computer model analysis of an infrared laser differential absorption remote sensing technique (DARS) is presented. An infrared laser source operating at two or more wavelengths and a heterodyne detection system are mounted on either an aircraft of satellite platform to monitor the differential absorption between the laser source and the earth surface. The capability of this technique for measuring gas concentrations in the lower 5 km of the atmosphere is emphasized. Numerical results are presented simulating measurements of vertical burdens of carbon monoxide, nitric oxide, methane, carbon dioxide, and ozone. Measurements of expected concentrations of these gases can be made with greater than 80% accuracy using realistic laser powers and system parameters. (Author abstract)

37106 **APTIC NO. 59389**

Sehmel, G. A.

AN EVALUATION OF A HIGH-VOLUME CASCADE PARTICLE IMPACTOR SYSTEM. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 109-115. 15 refs. (Dec. 10-12, Paper ISA JSP 6671.)*

Commercially available 20-cfm cascade impactors were evaluated under field sampling conditions for particle sampling bias caused by interstage losses and by non-wind direction sampler orientation. An integrated sampler using an impactor and a wind-direction self-orienting cowl attachment decreased particle sampling bias. (Author abstract)

37107 **APTIC NO. 60186**

Seki, Yukio, Eiki Nakayama, and Kunihiko Imoto

GAS CHROMATOGRAPHIC MEASURING METHOD OF HARMFUL SUBSTANCES. *(Gasu kuromatogurafi ni yoru yagaibutsu no sokuteiho). Text in Japanese. Rodo Eisei Kogaku (J. Ind. Hyg. Japan), no. 13:28-33, 1973. 7 refs.*

Gas chromatography offers many advantages in analysis of organic and solvent vapors in the air. The high-sensitivity flame ionization detector can analyze almost all organic solvents having a measurable vapor pressure at the operating temperature of about 300 C or lower. About 2 ml of the air sample is sufficient for a gas chromatographic analysis. The sampling methods, analyzers and detectors, and an analysis of ambient nitroglycol by gas chromatography. The sampling methods described are the direction injection method, the bubbler method using an absorbent, and the dry concentration method. The detectors are the thermal conduction detector (TCD), the flame ionization detector (FID), the electron collection type detector (ECD) and the flame photometric detector (FPD). In the analysis of nitrogylcol in the air by gas chromatography given as an example, a gas chromatograph with ECD was used. The glass column was 1 m long and 3 mm in diameter while the filling agent was chromosorb G, a 3-50 mesh carrier, and a fixing agent of 5% silicon GE XE-60 solution. The standard solution was prepared by mixing 0.1 microgram/l ml Ng water solution with the same amount of benzene or normal hexane, stirring the mixture for 1 min or longer, and separating the solvent layer. A 2-ml syringe was used for sampling. The operating conditions of the gas chromatography for this analysis such as packing and aging of the column, temperature, and applied voltage were given. The calibration curve, quantitative determination, and calculations involved in this analysis were briefly described.

37108 **APTIC NO. 59390**

SethuRaman, S. and R. M. Brown

A COMPARISON OF WIND SPEED AND TURBULENCE MEASUREMENTS MADE BY A HOT-FILM PROBE AND A BIVANE IN THE ATMOSPHERIC SURFACE LAYER. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 223-229. 4 refs. (Dec. 10-12, Paper ISA JSP 6699.)*

Two independent systems for determining wind speed and turbulence levels are being used in an on-shore diffusion study on Long Island near Brookhaven National Lab. Results obtained from the two instrument systems are compared to illustrate the differences in the measured values of the vector wind, mean wind speed, variance, turbulence level, and energy spectra. Details of the physical characteristics and relative advantages of a commercial Vector Vane and a three-dimensional hot-film sensor (anemometer) are also presented. Measurements of the mean wind speed and the turbulence compared well. The Vector Vane underestimated spectral densities for frequencies above 1 hertz. (Author abstract)

37109 **APTIC NO. 60339**

Sholtes, Robert S., E. H. Meadows, Jr., and J. B. Koogler

EVALUATION AND MODIFICATION OF FLUORINE SAMPLING AND ANALYTICAL METHODS. *Environmental Science and Engineering, Inc., Gainesville, Fla., Environmental Protection Agency Contract 68-02-0600, Program Element 1A1010, EPA-650/2-73-007, 125p., Oct. 1973. 27 refs.*

NTIS: PB-230954/AS

Three fluoride sampling and analytical methods were evaluated and modified. The sampling methods are the Arthur D. Little method, the C. E. Decker method (EPA), and the Florida method. With care in placement of thy probes and operation of the train, the EPA F method can give results on comparative tests that are within 5%. Data collected using the three EPA F trains simultaneously at field sites indicated that variation between EPA trains can be as good as 5% and as poor at 24%. In the concentration range of 10-100 ppm F, the average collection efficiency of the EPA train using water was 58% and using 0.1 N sodium hydroxide it was 77%. However, for two runs at about 100 ppm F, the collection efficiency of a similar train was 90% in the range of 0-4000 ppm. Statistical analysis of the data indicated no significant difference between water and NaOH as absorbing reagents; nor did analysis reveal differences in collection efficiency at different flow rates. Statistical analysis comparing the results of the Florida and EPA train indicated no significant difference between the two methods at the 99% confidence level. (Author conclusions modified)

37110 **APTIC NO. 60285**

Skala, George F.

PORTABLE PHOTOGRAPHIC ATMOSPHERIC PARTICLE DETECTOR. *(Environment/One Corp., Schenectady, N. Y.) U. S. Pat 3,756,720. 9p., Sept. 4, 1973. 5 refs. (Appl. Jan. 27, 1972, 8 claims).*

A compact, portable photographic atmospheric particle detector is described that is relatively independent of operator technique. It can be operated rapidly and easily in the field for use in field aerosol measurements in remote areas where concentrations of less than 1000 particles/cu cm area expected to be encountered. The detector includes a camera viewing a precise measurement illuminated volume of known dimension within an expansion type condensation chamber for photographically recording pictures of the cloud of liquid droplets produced about atmospheric particles as centers of condensation during a measurement cycle. This particle detector can measure more dilute concentrations of particles than prior detectors and gives fewer random counting errors than Aitken and Scholz type counters. (Author abstract modified)

37111 **APTIC NO. 59472**

Skare, Ingvar

TOTAL ALDEHYDES. SAMPLING: CUMULATIVE. ANALYSIS: TITRIMETRIC (BISULFITE METHOD). *National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health, Method Rept. T 105/73, 15p., 1973. 7 refs.*

A method for the sampling and analysis of lower aliphatic aldehydes in air is presented. The sampling method involves leading the aldehyde-containing air through a wash bottle containing a bisulfite solution (cumulative sampling); while the analysis involves oxidation of the excess bisulfite with iodine and splitting of the aldehyde complexes with an alkaline buffer. The liberated quantity of sulfite equivalent to the aldehyde quantity is finally titrated with a weak iodine standard solution. The sensitivity of the method is about one micromol aldehyde/sample titrated, while the relative standard deviation in the analysis step is less than 3% even at the sensitivity limit. High excesses of ketones, hydrogen sulfide, hydrogen cyanide, or phenol in the air sample will give positive interferences.

37112 **APTIC NO. 59876**

Steinberg, Martin

MULTICHANNEL EXHAUST GAS ANALYZER. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,743,426. 4p., July 3, 1973. 5 refs. (Appl. Nov. 26, 1971, 2 claims).*

An analyzer for determining the concentration of particular components of a multi-component mixture of gases, especially motor vehicle exhausts, and for determining the time variant concentration of components in the exhaust by measuring the absorption of the exhaust at selected optical wavelengths is described. The invention is lightweight and economical. The exhaust gas to be monitored is passed through a plurality of adjacently-positioned serially-connected absorption cells of varied length. A chopper wheel carrying a plurality of spectral filters sequentially passes radiation from a source at discrete wavelengths to each cell in sequence. The amount of radiation absorbed by the gas is detected to determine the concentrations of certain components in the gas. (Author abstract modified)

37113 **APTIC NO. 59897**

Stone, N. W. B. and J. E. Harries

SUB-MILLIMETRE SPECTROSCOPY APPLIED TO ATMOSPHERIC POLLUTION PROBLEMS. *Proc. Soc. Anal. Chem., 10(8):199-200, Aug. 1973. 5 refs.*

An interferometer can be used to obtain very high signal to noise atmospheric spectra between 10 and 40/cm. It can be used to detect various gases in the stratosphere and at lower levels. A sub-millimeter interferometer was mounted to aircraft and balloons. High resolution spectra were obtained from the aircraft; these spectra were recorded to a maximum resolution of 0.05/cm between London and Sydney and from London to Capetown. Water, ozoe, nitric acid, and nitrous oxide were measured with confidence, and measurements of nitrogen dioxide and sulfur dioxide are being improved.

37114 **APTIC NO. 60231**

Tada, Osamu

ON SAMPLING OF HARMFUL GASES IN AIR. *(Kichu yugaigasu no hoshu ni tsuite). Text in Japanese. Rodo Eisei Kogaku (J. Ind. Hyg. Japan), no. 13:17-20, 1973. 6 refs.*

Standard methods available for sampling gaseous substances are discussed. They include the container sampling method, the liquid absorbent method, the solid absorbent method, the condensation method, and the pyrolytic method. The container sampling method in which a vacuum bottle, gas sampler, or syringe is used for sampling is suited for spot sampling. The liquid absorbent method uses a sampler with a liquid absorbent which absorbs a gaseous substance as the sample air is fed into the sampler at a specified flow speed. The sampling conditions such as type of the absorbent to be used, air flow rates, and sample quantity should be determined for each gaseous substance by considering conditions involved in its analysis. In the solid absorbent method, active carbon, silica gel, or a similar material is used as the absorbent. The substance is absorbed by a solvent and dissolved in a specified amount of solution for analysis. The condensation method uses a sampler cooled with liquefied oxygen or carbon. This sampling method is primarily used in conjunction with an instrumental analysis. In the pyrolytic method, the sample air is led into a heating device in which gaseous substances contained in the air are pyrolyzed. The gas or fume produced as a result of the pyrolysis is then collected for analysis.

37115 **APTIC NO. 60250**

Tamori, I., N. Kogure, K. Imagami, and H. Nakamura

IMPROVEMENT OF ISOKINETIC DUST SAMPLER. *(Tosoku kyuinkan no kairyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):591, Oct. 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 312.)*

An isokinetic dust sampler was improved by shifting the in-nozzle static-pressure zone as close as possible to the nozzle to minimize the pressure loss and by enlarging the interior of the nozzle to recover pressure loss. Plots of suction error, which is expressed as the difference between duct flow speed and nozzle flow speed, against pressure difference at various dust flow rates revealed that isokinetic suction can be easily accomplished at any flow rate by adjusting the pressure difference to zero.

37116 **APTIC NO. 60129**

Tanaka, Akemi, Masahiro Hori, and Yoshitaka Kobayashi

ANALYSIS METHOD OF TRACE CYANIDES IN ATMOSPHERE USING HI-VOLUME SAMPLER. *(Haiboryumu sanpura o mochiita taikichu biryo shiankabutsu no bunsekiho). Text in Japanese. Preprint, Japan Society for Safety Engineering, Tokyo, p. 99-101, 1973. (Presented at the Safety Engineering Studies Presentation Meeting, 6th, Tokyo, Japan, Dec. 6-7, 1973, Paper 28.)*

Using a hi-vol sampler equipped with a glass fibre filter, an experiment was carried out to determine applicability of a high-vol sampler for sampling trace cyanides in the atmosphere. Results were compared with those of the conventional alkaline solution absorption method. The glass fiber filter was dipped in one of several adsorbents including 25% potassium carbonate, a solution of (0.5) nickel nitrate, and ammoniac solution of (0.5) nickel nitrate to improve the efficiency of arresting the cyanides. The third gave the highest efficiency. If the filter treated with the ammoniac solution of (0.5) nickel nitrate is kept in NH3 for 30 min or more before use, the cyanide-arresting efficiency is further improved. Other related aspects of this sampling method was also investigated. In the final analysis, the sampling performed for 20 min by a hi-vol sampler equipped with a glass fiber filter operating at 200 l/min (500 cu/min in terms of linear flow speed) gives collection of the atmospheric cyanides which usually requires 6-7 hr of sampling operation with the alkaline solution absorption method. The collection efficiency drops somewhat with a relative humidity of less than 20% but is not affected by temperature and humidity found under ordinary weather conditions.

37117 **APTIC NO. 59862**

Teboul, James Remy Albert, Andre Rene Baude, and Jean Schieving

DEVICE FOR DETERMINING THE TRANSPARENCY OF THE ATMOSPHERE. *(Compagnie des Compteurs, Montrouge (France)) U. S. Pat. 3,746,452. 14p., July 17, 1973. 20 refs. (Appl. Sept. 3, 1969, 8 claims).*

A device for determining the transparency of the atmosphere between two points comprising one light transmitter and one receiver on the two points is described, consisting of optic fibers connecting the corresponding transmitters and receivers, a means to separate the data coming through the atmosphere and through the fibers, and a data processing device. Most prior devices for measuring the dimming or absorption of light due to the diffusion of water particles contained in the atmosphere and for thus determining the transparency, were based on the measurement of the current supplied by an electric photosensitive member energized by a suitable light source through a given path in the atmosphere. The value of this current characterizes the radiation which reaches the receiver as a function of the absorption due to diffusion. The measurement can be erroneous, however, if the radiant source is not of invariable intensity and if the photosensitive receiver does not have an invariable sensitiveness. To overcome such drawbacks, it is usual to stabilize the voltage of the power generator which supplies the radiant source. However this is ineffective on the evolution of the output of the source itself, and it is difficult to stabilize the sensitiveness of the receiver. The present invention eliminates these problems because it is an entirely static device, and is not disturbed by variations in the transmission of the source or the sensitiveness of the receivers. The device also preserves the maximum value permitted by the equipment. Measurement may be made independently on the gain variations of electric signal amplifiers, generally associated with photosensitive receivers used in optico-electronic transmitter- receiving. Other advantages and the construction and design of the device are described.

37118 **APTIC NO. 59413**

Tombach, Ivar, Paul B. MacCready, and Lal Baboolal

USE OF A MONOSTATIC ACOUSTIC SOUNDER IN AIR POLLUTION DIFFUSION ESTIMATES. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 139-149. 23 refs. (Dec. 10-12, Paper ISA JSP 6677.)*

An acoustic sounder has been developed to study atmospheric structure by transmitting a pulse of sound upward and then receiving the energy which is scattered from turbulent fluctuations of atmospheric temperature. This instrument has been applied to the analysis and modeling of the diffusion of atmospheric pollutants. Information obtained or derived from its records in these studies has included the character of the stability of the atmosphere, the height of elevated inversions, the depth of the mixed layer, and estimates of the turbulent eddy scale in thermal plumes. A quantitative technique, using the acoustic sounder and one low-level anemometer, has been developed for the estimation of diffusion parameters in the lowest part of the atmospheric boundary layer. (Author abstract)

37119 **APTIC NO. 59369**

Turpin, P. Y., P. Reiss, J. Bricard, and G. Madelaine

NEW PHOTOELECTRIC METHODS IN AEROSOL MEASUREMENT. *(Nouveaux procedes photoelectriques de mesure des aerosols). Text in French. Rev. Gen. Thermique (Paris), 12(142):937-952, Oct. 1973. 16 refs.*

The principal optical characteristics of aerosols, and two different spectrophotometers for the study of aerosol granulometry, as well as a continuous-flux condensation nuclei counter are described. Spectrophotometers designed to measure diffused light are suitable for the determination of the granulometry and the concentration of aerosols by measuring light diffused laterally by the particles. A type B spectrophotometer measures the amplitude of pulses corresponding to the flux diffused by each particle passing through the photometer field. It is suitable for the determination of the granulometry of aerosols with a minimum particle diameter of 0.3 micron. A type T spectrophotometer measures the flux by counting discontinuous photon series. It is suitable for the granulometric investigation of aerosols with a minimum particle radius of 0.03 micron. The photoelectric condensation nuclei counter measures aerosol particle concentrations up to 2,000,000 particles/cu m, the minimum particle size being 0.001 micron. Comparative studies of model aerosols by the three photoelectric instruments showed good accordance in the measurement data.

37120 **APTIC NO. 60021**

Vekeny, Henrik

A DUST SAMPLER ADAPTED TO BMRC CRITERIA FOR THE GRAVIMETRIC DETERMINATION OF DUST CONCENTRATIONS IN MINE AIR. *(A BMRC kriteriumokhoz hangolt pormintavevo muszer a banyalevego porkoncentraciojanak gravimetrias meghatarozasahoz). Text in Hungarian. Banyasz. Kohasz. Lapok, Banyaszat, 106(9):577-586, 1973. 24 refs.*

A new LSG 1,5 type dust sampler, adapted to the BMRC (British Medical Research Council) criteria, for the gravimetric determintion of the fine dust fraction concentrations in mine air is described, and compared with a 113A type dust sampler. The dust sampler, in the form of an upright cylinder with a labyrinth intake at the bottom, is composed of an elutriator for flow separation and of a micro-glass fiber filter. The occurrence of the velocity profile required by BMRC was controlled optically, while the practical dust fractionating efficiency of the elutriator was checked by means of polydisperse coal dusts. Good agreement between the fractionating characteristics of the LSG 1,5 type dust separator and the BMRC criteria, and the measurement data obtained by means of the 113A type dust separator was established.

37121 **APTIC NO. 60173**

Wachter, Karl-August and Horst Rabenecker

GAS OR DUST DETECTING AND MEASURING APPARATUS. *(Dragerwerk A.G., Lubeck (West Germany)) U. S. Pat. 3,759,106. 9p., Sept. 18, 1973. (Appl. Sept. 8, 1972, 10 claims).*

A gas or dust detection apparatus is described. It consists of a bellows pump for drawing in the sample and a mechanical drive which is a continuously driven spindle drive. The spindle drive is automatically coupled to the movable part of the pump responsive to the termination of the pump s working stroke, and is automatically uncoupled from the movable part of the pump responsive to the termination of the return stroke. In one embodiment of the invention, the spindle drive includes a stationary threaded spindle secured to the movable pump and a split nut rotatable by the motor and movable into and out of threaded engagement with the spindle. A toggle or tilting lever mechanism effects engagement and disengagement of the split nut with the stationary spindle. In a second embodiment, the motor drives two rotatable threaded spindles having their axes in spaced parallel relation, and a connecting bar, having threads at each end, is connected to the movable part of the pump and is swung into and out of threaded engagement with the two spindles. The third embodiment also has two rotatable threaded spindles driven by the motor but cooperable with a split nut in the same manner as in the first embodiment. This apparatus is an improvement over previous amplers using a bellow pump which required the pump to be operated by hand, which caused inconsistencies. Since this apparatus has a working stroke produced by spring force and a return stroke produced by mechanical drive, it is also an improvement over samplers using a clockwork or an electric motor to drive the bellows pump and to spring-loaded gas-detecting hand pumps. (Author abstract modified)

37122 **APTIC NO. 59934**

Warner, Peter O.

RECENT ADVANCES IN AIR MONITORING INSTRUMENTATION. *Preprint, Wayne County Air Pollution Control Agency, Detroit, Mich., p. 239-246, 1973 (?). 14 refs.*

Various air pollution monitoring methods and instrumentation are reviewed. Sulfur dioxide can be measured by electric conductivity, iodine coulometry, flame photometry, and the West-Gaeke method. Nitrogen dioxide can be measured by the classical, manual Griess-Saltzman method, similar colorimetric methods, or continuous chemiluminescence methods. Ozone and oxidants can be measured continuously by potassium iodide colorimetry or electrometric methods. Chemiluminescence has also been used to measure ozone. Hydrocarbon monitoring methods include flame photometry and flame ionization for total HC and nonmethane HC, respectively. Nondispersive infrared spectrometry and flame photometry can be used to measure carbon monoxide. Suspended particles can be measured by an integrating nephelometer and an aerosol vapor condensation meter. Odors can be measured by gas chromatography, mass spectrometry, or an odor panel.

37123 **APTIC NO. 59380**

Wesolowski, Jerome J.

AMBIENT AIR AEROSOL SAMPLING. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 191-196. 3 refs. (Dec. 10-12, Paper ISA JSP 6692.)*

The characterization of ambient air aerosol to obtain information on the sources and evolution of the aerosol requires a complex sampling and analytical scheme. The measurements of the variations of the concentrations of specific chemicals in California air as a function of time, space, and particle size are discussed. Particular emphasis is placed on the sampling problems associated with the collection of the aerosol. (Author abstract)

37124 **APTIC NO. 59386**

White, Alan and Linda M. Beddows

THE CHOICE OF SAMPLING TUBY MATERIAL IN THE DETERMINATION OF NITROGEN OXIDE CONCENTRATIONS IN PRODUCTS OF COMBUSTION. *J. Appl. Chem. Biotechnol., 23(10):759-767, Oct. 1973. 6 refs.*

When hot products of combustion containing traces of nitrogen oxides are sampled through metal tubes the concentration falls. The mechanism is in part due to the conversion of nitrogen dioxide to nitric oxide. Glass tubing may be used as a substitute at high sampling temperature and polytetrafluorethylene is suitable at lower temperatures; nylon, ethyl vinyl acetate copolymer, and polyvinyl chloride tubing should not be used since significant losses may occur in these materials even at room temperature. (Author abstract)

37125 **APTIC NO. 59343**

Zaromb, Solomon

REMOTE SENSING APPARATUS AND METHODS. *(Assignee not given.) U. S. Pat. 3,768,908. 11p., Oct. 30, 1973. 5 refs. (Appl. Jan. 4, 1971, 16 claims).*

A remote sensing lidar spectroscopic apparatus has been developed to provide an optical means of detecting such commonly encountered air pollutants as sulfur dioxide, nitrogen dioxide, and ozone at distances over 1 mi. The invention consists of a laser transmitter and a receiver in which the radiation return is spectranalyzed, a fluorescent target at a considerable distance from the transmitter and receiver, and a means for aiming the transmitter and receiver at the target. The transmitted radiation is preferably in the 0.25-0.3 micron range of ultraviolet wavelengths, such as those obtainable from the fourth harmonic of a neodymium laser or from the second harmonic of an argon-ion laser. The presence of pollutants between the lidar system and the target is deduced from the attenuation of the radiation return at several wavelengths and/or from the Raman backscatter due to specific air pollutants. (Author abstract modified)

37126 **APTIC NO. 59418**

Zoller, W. H.

PHOTON ACTIVATION ANALYSIS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 185-189. 10 refs. (Dec. 10-12, Paper ISA JSP 6691.)*

Instrumental photon activation analysis using bremsstrahlung from an electron linac has been used to measure the concentrations of 19 elements in atmospheric particulate samples. The technique is sensitive, nondestructive, and capable of analysis of fuels such as gasoline, fuel oil, residual oil, and coal in addition to filter and cascade impactor samples. The list of elements that are easily measurable down to the submicrogram range includes lead, nickel, arsenic, zinc, antimony, bromine, and iodine. The sensitivity of the technique is intermediate between neutron activation and atomic absorption. (Author abstract)

37127 **APTIC NO. 59411**

TETHERED BALLOONS. *(Aerostation). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), no. 186:7-24, Nov. 1973. 2 refs.*

New requirements for heavy payloads have led, in 1966, to the development of operational tethered balloons reaching 15,000 cu m capacity and capable of standing wind speed over 25 m/sec. A brief description of the balloons and accessories is given. The use of large quantities of hydrogen, together with synthetic fabrics (materials highly electrifiable) requires unusual safety techniques to make the balloons as safe as possible. Pollutant sampling is performed by hanging apparatus on a tethered balloon cable. A carrier-borne radio probe is used to measure pressure, temperature, water vapor content, and wind velocity. Balloon handling operations are described. After a brief description of the apparatus, some representative results are given. The effect of temperature inversion is an important modifier of pollutant diffusion. (Author abstract)

37128 **APTIC NO. 59910**

AIR QUALITY MONITORING. *(Die Luftueberwachung). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:359-365, Dec. 1973.*

Problems and significance of air pollution monitoring networks are discussed. Air pollution monitoring networks are required to supply measurement data for the determination of the course and trends in air pollutant concentrations over extended periods of time, of mean values, peak values, as well as of the magnitude, duration, and frequency of peak values. The measurement data supplied by monitoring networks are only relevant if the sampling sites, the number of the sampling stations, and the sampling time have been chosen adequately. Statistical calculations shows that 100 random samples, taken on 100 days of the year, are required at each sampling site for the relevant characterization of the evolution of the pollutant concentrations. Monitoring networks are also able to predict catastrophic situations with critical air pollution levels for the initiation of adequate control measures in time.

1972

37129 **APTIC NO. 59572**

Burke, Richard and J. H. Stuart

ATMOSPHERIC CONTAMINANT SENSOR. BOOK 3 OF 3 - ADDENDUM. (FINAL REPORT). *Perkin-Elmer Corp., Pomona, Calif., Aerospace Div., National Aeronautics and Space Administration Contract NAS9-12066, NASA-CR-128604, Perkin-Elmer SPO 30249, 46p., Sept. 1972.*

NTIS: N73-11395

An atmospheric contaminant sensor (ACS) was modified to include carbon monoxide measurement. The period of performance and cost were minimized by utilizing, as much as possible, a nondispersive infrared (NDIR) CO monitor previously developed. The modification program is described, and drawings and photographs of the new system are given. The flow rate through the ACS was 0.04 standard cu ft/hr, the flow rate through the CO analyzer was 2.0 standard cu ft/hr, which produced a response in less than one minute. Specifications are given for the analyzer which can measure atmospheric contaminations of 0-100 ppm nitrous oxide, 0-3% carbon dioxide, 0-1% hydrocarbons, 0-300 ppm methane, 0-1500 ppm Freon 11, 12, and 114, and other substances. Test data for analysis of CO are presented. An attachment describes a new technique for measuring trace quantities of CO by a NDIR fluorescent source analyzer. Another attachment describes the test plan, calibration, and results of the CO analyzer.

37130 **APTIC NO. 59435**

Cigula, Mira, Mirka Fugas, and F. Valic

DETERMINATION OF THE ATMOSPHERIC 1,12-BENZPERYLENE, 1,2-BENZPYRENE AND THE CARCINOGEN 3,4-BENZPYRENE BY THE RING OVEN METHOD. *(Odredivanje 1,12-benzperilena, 1,2-benzpirena i kancerogena 3,4-benzpirena u atmosferi metodom ugrijanog prstena). Text in Serbo-Croation. Arhiv Hig. Rada, 23(3):199-207, 1972. 23 refs.*

A method for the semiquantitative determination of 1,12-benzperylene, 1,2-benzpyrene, and the atmospheric carcinogen 3,4- benzpyrene has been developed using the ring oven technique. Pure polycyclic aromatic hydrocarbons (3,4-benzpyrene, 1,2- benzpyrene, 1,12-benzperylene, perylene, 1,2-benzanthracene, pyrene, fluoranthene) as well as the mixtures of these hydrocarbons in outdoor smoke samples can be washed into the ring by cyclohexane. The blue-green fluorescent rings obtained are visually compared with the standard quinine sulfate rings that give the same fluorescence intensity under 366 nm primary ultraviolet radiation. The fluorescent intensity of 3,4-benzpyrene, 1,2- benzpyrene, and 1,12-benzperylene adsorbed on paper is so much higher than the intensity of other analyzed polycyclic aromatic hydrocarbons in concentrations typical of urban air that the share of the latter can be neglected. Thus a preliminary determination of the average relationship between the concentrations of 3,4 benzpyrene, 1,2-benzpyrene, and 1,12-benzperylene in a certain area may allow for the estimation of the concentration of the important carcinogen 3,4-benzpyrene.

37131 **APTIC NO. 59532**

Collis, R. T. H. and E. E. Uthe

LIDAR PROBING OF THE ATMOSPHERE. *In: Mathematics of Profile Inversion. Proceedings of a Workshop held at Ames Research Center, Moffett Field, Calif. 94035. July 12-16, 1971. Stanford Research Inst., Calif., Atmospheric Sciences Lab., National Aeronautics and Space Administration TM X-62,150, p. 2-31 to 2-49, Aug. 1972. 151 refs.*

NTIS: N73-11595

The basic lidar concept and examples of lidar observations are discussed. Lidar uses laser energy in a radar fashion to observe atmospheric backscattering as a function of range. Because of the short optical and near-optical wavelengths used, very small particles and even the gaseous molecules cause significant scattering. This can complicate the evaluation of the observations by introducing attenuation along the path as a second unknown into the lidar equation. In many cases, however, the observations may be interpreted directly on a qualitative basis and will show the distribution of particulate matter in clear air or enable the dimensions of visible cloud to be measured accurately. In other cases, particularly where additional data are available, quantitative solutions can provide useful information on remote targets such as tenuous smoke clouds or haze layers. Examples of such observations are given, illustrating the computational approach to the evaluation of the volume concentration of natural dust and haze layers in the lower atmosphere and the mass concentration of a smoke plume. In both cases, lidar data are related to independently obtained data on the particulate concentrations involved. (Author abstract modified)

37132 **APTIC NO. 59454**

Copeland, G. E. and A. R. Bandy

CORRELATION OF SATELLITE AND GROUND DATA IN AIR POLLUTION STUDIES. *Old Dominion Univ. Research Foundation, National Aeronautics and Space Administration ERTS-1 Contract MMC 229-01, GSFC ID UN672, Task 1 (UN 672), 6p., Sept. 30, 1972.*

NTIS: N72-33317

The image analysis laboratory, implementation of ground truth facilities, and examination of U-2 imagery of the Chesapeake Bay region are described. These were studied during a correlation of ERTS-1 satellite and ground data in air pollution studies. The primary area studied by satellite photography was centered on the entrance to the Chesapeake Bay in Virginia. Ground data came from 25 air quality data stations in the target area. Meteorological data and information on major fires was also compiled. As of Sept. 30, 1972, no ERTS-1 imagery has been available of the target area due to cloud cover. Imagery of several complete orbital passes over the U. S. was viewed, and evidence was established that smoke plumes can be detected by ERTS-1.

37133 **APTIC NO. 59463**

Davis, Warren F. and Judson W. Graab

PROCEDURE FOR RAPID DETERMINATION OF NICKEL, COBALT, AND CHROMIUM IN AIRBORNE PARTICULATE SAMPLES. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-2672, Rept. E-7105, Work Unit 501-01, 16p., Nov. 1972. 13 refs.*

NTIS: N73-11111

A rapid, selective procedure for the determination of 1-20 micrograms of nickel, chromium, and cobalt in airborne particulates is described. The method utilizes the combined techniques of low-temperature ashing and atomic absorption spectroscopy. The airborne particulates are collected on analytical filter paper, the paper is ashed, and the residues are dissolved in hydrochloric acid. The Ni, Cr, and Co are then determined directly with good precision and accuracy by atomic absorption. The effects of flame type, burner height, slit width, and lamp current on the atomic absorption measurements are reported. Speed and convenience are increased by the use of dual-channel instrument, which permits simultaneous measurement of two elements, and by the use of the same flame conditions for all three elements. Since no separations, filtrations, or transfers of solutions are necessary, 20 samples may be analyzed in 2 hr. The recovery of Ni, Cr, and Co is 92-100% complete. This is satisfactory in the 0.2-1.0 ppm range and gives confidence in the precision and accuracy of the procedure.

37134 **APTIC NO. 59902**

Eichmeier, J.

COMPARISON OF MOBILITY SPECTRA OF NATURAL AIR IONS AND OF THE METHODS OF MEASUREMENT. *(Vergleich der Beweglichkeitsspektren von natuerlichen Luftionen und der verwendeten Messverfahren). Text in German. Z. Geophys., vol. 38:915-923, 1972. 22 refs.*

Different methods available for measuring the mobility spectrum of natural atmospheric ions in the small, medium and large ion size ranges, as sell as the results of measurements, obtained by different authors are compared. The methods available for the measurement of the mobility spectra of small, medium and large ions are the repeated measurement of the air polar conductivity and of the corresponding small ion concentration; and the measurement of the current-voltage characteristic of a cylindrical suction condenser with an undivided or divided inner electrode. A comparison of results obtained by Nolan and Sachy, Scholz, Sherman, Yunker, Misaki, Agarwala, Sikana, Whipple, Beckett, Hoegl, Eichmeier, Israel and Schulz, Weger, Junge, Ortner and El Nadi shows that the mobility of the small ions lies within a range of 1 to 2 sq cm/Vs. Since all methods reviewed are based on the suction principle, they have inherent errors due to disturbances at the suction edge and to departures from laminar flow.

37135 **APTIC NO. 59802**

Geul, Herman R.

EXHAUST GAS ANALYZER FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,674,436. 7p., July 4, 1972. 5 refs. (Appl. Aug. 22, 1969, 6 claims).*

A novel exhaust gas analyzer for internal combustion engines is described. It combines the known measure of exhaust gases based upon the thermal conductivity of the exhaust gases and the known measure based upon the catalytic burning of the exhaust gases into one system. The output signals obtained by these two measurements, made simultaneously, are subtracted from each other. This results in an analyzer which has an unequivocal indication in the region below and above the stoichiometrical point. The device consists of two measuring elements connected into two opposite branches of a Wheatstone bridge circuit. (Author abstract modified)

37136 **APTIC NO. 60041**

Harman, John N., III and Radhakrishna M. Neti

NO2 ANALYSIS AND SCRUBBER THEREFOR. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,677,708. 4p., July 18, 1972. 4 refs. (Appl. Dec. 15, 1969, 7 claims).*

A method and apparatus for determining nitrogen dioxide in a sample gas stream containing interferents has been developed utilizing a scrubber which is capable of selectively removing such interferents without affecting the NO2 content of the gas stream; the method thus permits NO2 determination by an instrument sensitive both to NO2 and interferents. The scrubber employs argentic oxide (AgO) which is capable of removing both positive and negative interferents without reacting with NO2 at levels normally encountered in air. Contaminants sometimes found in AgO can be removed by placing the scrubber containing AgO in a vacuum desiccater at a vacuum of about 20 in. of mercury and 80 C for about 24 hr. It may also be advantageous to provide a scrubber material for removing certain reductants such as hydrogen sulfide and mercaptans when these are present at levels sufficient to reduce the working life of the AgO.

37137 **APTIC NO. 60150**

Herbolsheimer, Ralf, Leo Funk, and Heinz Drasche

ON THE APPLICABILITY OF ACTIVATED CARBON AS AN ADSORBENT FOR THE DETERMINATION OF TRICHLOROETHYLENE IN THE AIR. *(Ueber die Verwendbarkeit von Aktivkohle als adsorptionsmittel zur Bestimmung von Trichloraethylen in der Luft). Text in German. Staub, Reinhaltung Luft, 32(10):407-409, Oct. 1972. 5 refs.*

The applicability of activated carbon as an adsorbent for the subsequent gas chromatographic determination of the workplace concentration of trichloroethylene is described. Such adsorbers should sample trichloroethylene in the respiration zone, and should be attached to the helmet worn by the workers. Merck-type activated carbon in the 0.75-0.2 mm fraction, previously activated at 200 C for 60 min, practically quantitatively adsorbed trichloroethylene from the air even at 100% relative humidity. The recovery rates were in a range of 95-100%. Following desorption with n-decane, trichloroethylene was determined by means of gas chromatograph with a double flame ionization detector and with chromosorb 42/60 mesh-filled column at a column temperature of 110 C.

37138 **APTIC NO. 59223**

Loeffler, F. and W. Muhr

IMPROVED CALCULATION OF THE PARTICLE INERTIAL SEPARATION ON FIBERS. *(Verbesserte Berechnung der Teilchenabscheidung an Fasern infolge Traegheitskraeften). Text in German. Inst. Natl., Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 13p. 11 refs. (May 3-5.)*

An improved method for the calculation of the particle separation by elemental cylindrical fibers in general, and of the rate of impact on the fiber (a factor in determining the separation efficiency) is presented. Compared to known calculation methods, the new method has the advantage of taking the flow boundary layer along the fiber cylinder surface for high Reynolds numbers of 50-100 into account. The boundary layer flow was calculated from the Hohlstein-Bohlen equations. The degree of impact was found to be dependent not only of the inertia parameters but also of the Reynolds number even in the case of pure potential flow. When the boundary layer is taken into account; the rate of impact is essentially lower, since the effect of the boundary layer increases with the reduction of Reynolds number. The influence of the boundary layer reduces with increasing inertia parameter.

37139 **APTIC NO. 60134**

Luckat, Siegbert

METHOD FOR THE DETERMINATION OF GASEOUS POLLUTANT CONCENTRATIONS IN THE AIR. *(Ein Verfahren zur Bestimmung der Immissionsrate gasfoermiger Komponenten). Text in German. Staub, Reinhaltung Luft, 32(12):484-486, Dec. 1972. 6 refs.*

A device and method for the determination of the absorption rate of gaseous air pollutants, based on a reaction of the pollutant with a liquid surface, is described. The absorption liquid is transported by a circulation system to a vertical cylindrical carrier which it soaks and wets uniformly. A coherent liquid film develops which equals the geometric surface of the carrier, and thus represents a standard measuring area. Depending on the absorption solution chosen, different pollutants can be determined separately or possibly even jointly by known analytical methods. Laboratory tests concerning the absorption of sulfur dioxide in sodium hydroxide solution with 10% ethylene glycol revealed linear relationship between the rate of SO2 absorption and the SO2 concentration, as well as between the rate of absorption and the absorption duration.

37140 **APTIC NO. 59761**

McCrea, D. H. and A. J. Forney

THE APPLICATION OF A DRY ABSORBENT FOR SULFUR AND NITROGEN OXIDES TO FLUE GAS ANALYSIS. *Preprint, 1p., 1972. 8 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 23rd, Cleveland, Ohio, March 6-10, 1972, Paper 324.)*

The application of a dry absorbent of alkalized alumina for sulfur and nitrogen oxides to flue gas analysis is described. The feasibility of gas analysis was demonstrated by showing that all of the sulfur oxides and NOx in a flue gas can be removed and that sufficiently high S and nitrogen concentrations can be obtained on the solid to allow reasonably accurate determinations. The absorbent might also be used to condition gas samples prior to instrumental analysis. Ash will be effectively trapped on the granules; SOx and NOx that could interfere with the oxygen analysis will be removed. Its use should

also lengthen the life of chromatographic columns on which SOx and NOx are permanently absorbed.

37141 **APTIC NO. 59455**

Miranda, Henry A., Jr. and John Dulchinos

A BALLOON-BORNE AEROSOL COUNTER. (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA Technology Div., Air Force Cambridge Research Labs., Contract F19628-70-C-0265, Proj. 7621, TASk 762103, Work Unit 76210301, DoD Element 34111F, DoD Subelement 6369AJ, AFCRL-71-0416, GCA-TR-71-3-A, 76p., Jan. 1972. 7 refs.*

NTIS, DDC: AD 737802

A balloon-borne aerosol counter which samples and sizes individual particles to an accuray of + or 10% over an order of magnitude size range extending down to the 0.1-0.2 micron diameter regime, was successfully flown. The aerosol counter system uses a laser and operates on the principle of light scattering. The device is completely self-contained and recoverable. The data are recorded on 9-channel magnetic tape in digital format compatible with an IBM 360 computer, and are processed automatically. Stratospheric aerosol size distributions were obtained in increments of 1 and 2 km, up to and including balloon float altitudes (above 23 km). These represent the first such direct information available, and are presented here in preliminary form. A description of the device, together with a discussion of calibration and automatic data reduction procedures and with recommendations for improvements in the latter, are given. The computer program is discussed, and field data are given. (Author abstract modified)

37142 **APTIC NO. 59524**

Ranzieri, Andrew J.

AIR QUALITY MANUAL. MATHEMATICAL APPROACH TO ESTIMATING HIGHWAY IMPACT ON AIR QUALITY. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S-4-72-12, 72p., July 1972. 22 refs.*

A California Division of Highways air quality manual on a mathematical approach to estimating highway impact on air quality has been prepared as part of a program designed to train district personnel in assembling air quality reports. Topics covered under corridor analysis include: mathematical assumptions; input data required for mathematical analysis (traffic, emission factors, wind parameters, type of highway design, and horizontal and vertical dispersion parameters); output from mathematical analyses; calculations for crosswinds; calculations for parallel winds; and superposition with cross or parallel wind conditions. Mesoscale analysis and sensitivity analysis are also examined.

37143 **APTIC NO. 59491**

Riediger, G.

PARTICLE COUNTING AND PARTICLE SIZE ANALYSIS BY MEANS OF THE QUANTITATIVE TELEVISION MICROSCOPY. *(Teilchenzaehlung und Teilchengroessenanalyse mit Hilfe der quantitativen Fernseh-Mikroskopie). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 16p. (May 3-5.)*

The principle and possibilities of quantitative television microscopy in particle counting and particle size analysis, as well as comparative analyses with the Quantimet quantitative television microscope and projection microscope, are described. Quantitative television microscopes are composed of an epidiascope, a light or electron microscope, a television camera with monitor, a detector, and a computer. Such television microscopes require well-defined optic and electronic ajustments for reproducible measurements, and their results as well as the particle counts obtained, are basically determined by the adjustment of the gray threshold. They are suitable for objective analysis, especially of thermal precipitator and conimeter samples. Conimeter samples removed after heating the adhesive layer were analyzed by two persons using the Quantimet microscope, and a correlation of 0.997 was obtained for the two measurements. The correlation factor was somewhat lower (0.988) for conimeter samples that were not heated for their removal. The correlation factor calculated for measurement data obtained by means of Quantimet and a projection microscope was 0.983.

37144 **APTIC NO. 59473**

Skare, Ingvar

NITROGEN DIOXIDE - MANUAL METHOD. *National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health, Method Rept. T 131/72, 15p., 1972. 5 refs.*

A manual method for the sampling and analysis of nitrogen dioxide is presented. The analysis method is based on direct absorption of NO2 from the air sample in a Saltzman reagent for the production of a red-violet color whose extinction is proportional to the amount of NO2 absorbed. The method's high sensitivity allows for analyses with air samples less than half a liter. Two alternative sampling procedures are presented: sampling in evacuated gas pipettes (0.7-10 ppm) and sampling in a syringe (1-15 ppm). Sensitivity of the method is about 1 ppm NO2 for the syringe technique and about 0.7 ppm NO2 for the gas pipette technique. Relative standard deviation for both methods is within plus or minus 10%. Strong oxidizing agents such as ozone or chlorine and reducing compounds such as hydrogen sulfide or sulfur dioxide can interfere with the results at high excess; nitric oxide, although it doesn't react with the reagent, can interfere at high concentrations by oxidation to NO2.

37145 **APTIC NO. 60088**

Smith, Avery B.

COLORIMETRIC INDICATOR FOR THE DETECTION OF NITROGEN DIOXIDE. *(Resource Control, Inc., West Haven, Conn.) U. S. Pat. 3,681,027. 5p., Aug. 1, 1972. 5 refs. (Appl. May 28, 1971, 4 claims).*

A small, pocket type colorimetric indicator for field detection of atmospheric nitrogen dioxide contamination has been developed to overcome prior art disadvantages associated with shelf life of the indicator and adaptability for large numbers of tests. A powder compact of diazotizing, coupling, and stabilizing agents is mechanically supported to provide a self-contained, one-time indicator unit that is discarded after use. Sulfanilic acid and sulfanilimide are employed as the diazotizing agents, while N(1-naphthyl) ethylenediamine dihydrochloride or acetate are used as the coupling agents. Suitable stabilizing agents having the requisite whiteness to avoid masking the color change in the indicator composition include boric acid and magnesium sulfate or Epsom salt, especially in combination with very fine mesh silica gel. (Author abstract modified)

37146 **APTIC NO. 60103**

Van Dusen, Harold A., Jr.

AMBIENT CONTAMINANT COLLECTING DEVICE. *(McGraw-Edison Co., Milwaukee, Wis.) U. S. Pat. 3,679,311. 3p., July 25, 1972. 1 ref. (Appl. Feb. 11, 1971, 13 claims).*

A device for sampling and measuring particulate ambient air pollutants has been designed such that compared to prior art devices of similar function it is inexpensive and simple, requires no power source, can be easily placed wherever desired, and requires relatively unsophisticated measuring equipment for measuring light transmission through a glass or other transparent plate. The device is particularly suited to determining the effects of ambient conditions on luminaire assemblies, although it may also be employed to determine the effect of atmospheric contaminants for other purposes; e.g., selected absorbing or reacting materials can be placed within the chamber to obtain samples and quantity measurements of gaseous contaminants. The device has a chamber for collecting solid particle contaminants precipitated from an air flow pumped by an omnidirectional venturi located at the top of the chamber. The chamber has a wind and rain shielded air inlet and has a glass bottom of two sections with an internal section exposed to the contaminants precipitated within the chamber and an external section exposed to contaminants outside the chamber. The bottom is removable so that transmission of light through the two pieces may be measured to give a determination of both particulate density within the chamber and ambient contaminant effects on the external section. (Author abstract modified)

37147 **APTIC NO. 59865**

Van Luik, Frank W., Jr. and Peter E. Coffey

LOW CONCENTRATION CONSTITUTENT OF GASEOUS MIXTURE SELECTIVE CONVERTER AND DETECTOR. *(Environment/One Corp., Schenectady, N. Y.) U. S. Pat. 3,674, 435. 5p., July 4, 1972. 6 refs. (Appl. June 5, 1970, 18 claims).*

Accurate measurement of the concentration of a gaseous material in a sample atmosphere containing another, interfering gaseous material is obtained by selectively reducing the concentration of the second, interfering gas while maintaining the proportionate concentration of the selected gas at a measurable level. The selected gas is then converted into condensation nuclei which are measured to yield an accurate indication of the concentration of the selected gas in the sample atmosphere. Similar, prior methods were used to determine sulfur dioxide, however, concentrations of carbon monoxide above 1 ppm caused interference in the detection and measurement of condensation nuclei indicating the amount of SO2 present; and methods of eliminating CO by burning in the presence of bottle gas also removed SO2. A similar problem existed in the measurement of nitrogen dioxide in the presence of nitric oxide. Thus, the method discussed is improved over prior art by eliminating interfering gases with a permselective membrane. (Author abstract modified)

37148 **APTIC NO. 59484**

National Board of Occupational Safety and Health, Stockholm (Sweden), Dept. of Occupational Health

SULFUR DIOXIDE - MANUAL METHOD. (FINAL REPORT). *Method Rept. T 126/72, 14p., 1972. 7 refs.*

A method for the sampling and analysis of sulfur dioxide concentrations in the range of 1-50 ppm is presented. The method used is the thorin procedure which is based on the hydrolysis and oxidation of sulfur dioxide to sulfate by the absorption solution. The sulfate content is then titrated with barium ions to give a barium sulfate precipitate. The end-point of the titration is established by the metal indicator thorin which gives red complexes with most metal ions. Analysis of low concentrations of sulfate requires the use of a photometric device for the end-point determination. The sensitivity of the procedure is about 0.5 micromols of SO4 per sample titrated, and the relative standard deviation of the analysis can be kept within plus or minus 5% in the range of 0.5-5 micromols SO4 per sample titrated. The most severe interferences to the method arise from the presence of calcium, iron, and aluminum; all of these can be eliminated by using a proper filter connected before the sampling vessel. Normally, the only interference to take into account is hydrogen sulfide gas.

37149 **APTIC NO. 59525**

National Aeronautics and Space Administration, Hampton, Va., Langley Station

LASER DETECTS POLLUTION. TELESCOPE-MOUNTED SENSOR IDENTIFIES MOONLIGHT POLLUTERS. *Electromech. Des., 16(12):12, Dec. 1972.*

A laser that remotely detects air pollution gases discharged from industrial smokestacks has been developed by the National Aeronautics and Space Administration in cooperation with the Environmental Protection Agency. Beamed at the emissions from an industrial smokestack, the telescope-mounted laser identifies pollutants by their characteristic reflected light wavelengths. Pollutants such as sulfur dioxide reflect light at a specific frequency which is detected through optical filters attached to the laser. The laser should be accurate up 1 km awav from an exhaust stack and can be beamed in many directions to seek pollutants in the air. Present sampling systems can only measure pollutants at the base of a smokestack, while the laser detector can measure exhaust plumes in the atmosphere. The EPA is interested in using the laser device for remote sensing of various types of industrial plants. The detector is accurate only at night since daylight background scattering interferes with its detection capability.

1971

37150 **APTIC NO. 60318**

Barringer, A. R.

ATMOSPHERIC POLLUTION MONITORING. *Preprint, Instrument Society of America, 32p., 1971. 19 refs. (Presented at the Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 1971.)*

NTIS: N72-31611

The importance of atmospheric pollution has caused many countries to set up monitoring systems. Before control can be achieved, adequate methods of monitoring and measuring are essential. Instrumentation requirements for air pollution monitoring are described. The major pollutants (carbon monoxide, particulates, oxidants, sulfur oxides, ozone, hydrocarbons, and nitrogen oxides), their sources, and their levels in nonurban and urban areas, are described. Ambient point samplers, used for gaseous monitoring, include colorimetric, coulometric, flame photometric, electrochemical, conductometric, chemiluminescent, ultraviolet absorption, nondispersive infrared spectrometric, flame ionization, and gas chromatographic methods. Gaseous monitoring can also be accomplished by source monitors, optical long line methods (such as correlation spectroscopy, correlation interferometry, Fourier transform interferometry, nondispersive gas cell analyzers, heterodyning tunable diode laser analyzers, absorption along a tunable laser beam, and measurement of Raman backscatter from a pulsed laser), and remote sensing (horizontal sensing and vertical sensing techniques include radiometers, spectrometers, interferometers, optical correlation instruments, and laser systems). Particulate monitoring includes non-remote sampling (dustfall jars, horizontal adhesive surfaces, impactors, spot or tape samplers, and high volume samplers) and remote sensing (Volz sunphotometer, searchlights, space photography, and lidar). Some applications of pollution monitoring in implementing pollution control are discussed, including the use of predictive models, computer plots, and remote sensing. The potential for monitoring air pollution from satellites is also reviewed.

37151 **APTIC NO. 59515**

Brink, J. A., Jr. and J. D. Porthouse

EFFICIENT DUST CONTROL VIA NEW SAMPLING TECHNIQUE. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. F96-F100. 6 refs. (Reprinted from Chemical Engineering, March 10, 1969.)*

A total dus sampler which includes an industrial high-volume vacuum cleaner plus air flow and pressure measuring devices has been designed to provide accurate data for the design of dust-control systems, particularly in relation to air requirements, dust loadings, and particle size distribution. Three manometers are included in the apparatus: one measures the internal gage pressure of the process vessel, while the other two measure the pressure drops across the bag filter and orifice meter. The industrial vacuum-cleaner portion of the sampler can deliver 80 cfm at a pressure drop of 65 in. of water. Dust loading is determined by dividing the change in sampler weight by the total volume of gas that passes through the sampler during the test; and particle-size distribution is obtained by mixing the sample from the drum to ensure uniformity, subdividing it, and then analyzing a representative portion. Screening is adequate for determination of particle size distribution if the particle size is relatively large. Examples of typical applications are presented.

37152 **APTIC NO. 59937**

Brink, J. A., Jr.

CASCADE IMPACTOR FOR ADIABATIC MEASUREMENTS. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. F85-F95. 15 refs. (Also: Industrial and Engineering Chemistry, 50(4):645-648, April 1958.)*

Commercially available impaction devices for particle sizing are reviewed along with design considerations for setting up sampling trains. An inline cascade impactor and accessory equipment have been developed by Monsanto for adiabatic measurements on industrial processes. The cascade impactor has five inline stages, each of which has a jet that utilizes a collection cup as an impaction plate. A glass cyclone is used upstream from the impactor. The apparatus has been tested extensively and has proven to be a practical field instrument for the measuring of aerosol particle-size distributions and for determining the collection efficiencies of different types of dust and mist collectors. Another commercially available impaction device is the Anderson sampler, a multijet sampler which contains up to eight stages and is available as either a minisampler on a stack sampler. The stack sampler is designed for extreme conditions where corrosive gases and high temperatures may be involved. Isokinetic sampling in the range of 100-13,000 ft/min can be obtained with the full eight stages in place. Sampling train design for a given application involves the testing of collection efficiency which may be accomplished either by supplying to the train a known quantity of the contaminant prepared synthetically or by following the proposed train during the first plant sampling with another device. Considerations examined include: sample flow metering, motive devices, and relating sample volume to stack conditions.

37153 **APTIC NO. 59258**

Dinges, H. W. and K. Lenhardt

MASS SPECTROSCOPIC INVESTIGATIONS OF AIR POLLUTION: DETECTION METHOD FOR ORGANIC SUBSTANCES. *(Massenspektrometrische Untersuchungen von Luftverunreinigungen; hier: Nachweismethode fuer organische Substanzen). Text in German. Technical Report of the Research Institute of the Fernmeldtechnisches Zentralamt der Duetschen Bundespost, Jan. 1971, 45p. 9 refs.*

NTIS: N72 31619

A mass spectroscopic procedure for the identification and quantitative determination of trace quantities of organic substances in the air, dangerous pollutants for platinum metal and tungsten components in communication equipment, is described. The spectra of pure organic substances, such as of olefins, alcohols, organic acids, aldehydes, ketones, and benzene derivatives, are determined by means of a simple focussing mass spectrometer, and catalogued for the identification of unknown organic components. The air samples to be analyzed for organic vapors are separated to different fractions in a Porapak Q-filled column, after which the samples are bombarded with electrons under high vacuum. The identification of substances with the same mass is possible by fragmentation. Mass spectra of the reference substances n-paraffins, n-hexane and its isomers, n-propane, n-propene, heptenes, methanol, ethanol propanol, n-butanol, propylene oxide, propione aldehyde, acetone, and allyl alcohol are given.

37154 **APTIC NO. 59222**

Levina, T. A. and V. L. Gershkovich

MEASUREMENT OF THE DEW POINT OF FLUE GASES. *(Izmereniye temperatury rosy dymovkyh gazov). Text in Russian. Tr. Inst. Goryuch. Iskop., Moscow, 26(1):73-77, 1971. 7 refs.*

Three different dew point measuring instruments; two based on Johnstone s principle, and one galvanic type, were studied concerning their suitability for dew point measurement in hot, dusty, flue gases as a means of controlling the neutralization of sulfur trioxide by gaseous ammonia. The instruments were inserted in the flue gas duct in a temperature zone of 180-200 C where the flue gas flow rate was in a range of 10-12 m/sec. Ammonia was dosed at a rate of 20 l/hr in a temperature zone of 200-220 C. With a sulfur dioxide concentration of 0.13-0.27% by volume, the rate of SO2 conversion to SO3 was 1.2-3.6%. The galvanic sensor with annular electrode and universal cooling, artificial heating, and low-inertia measurement of the electromotive force was found best for dew point measurement and control of the SO2 neutralization with ammonia in flue gases with high dust concentrations.

37155 **APTIC NO. 59451**

Measures, R. M.

A COMPARATIVE STUDY OF LASER METHODS OF AIR POLLUTION MAPPING. *Toronto Univ. (Ontario), Inst. for Aerospace Studies, UTIAS Rept. 174, 28p., Dec. 1971. 36 refs.*

NTIS, DDC: AD 746280

A comparative study was made of three laser methods for remotely mapping gaseous pollutants. Differential absorption and scattering were superior for measuring nitrogen dioxide and sulfur dioxide with regard to range and sensitivity than either laser-induced fluorescence or Raman backscattering. Because of the sophistication of this system and the difficulty of interpretation, it is strongly recommended that from the long-term view the fluorescence approach should be pursued further, since it has a range and sensitivity superior to the Raman scattering method for a given laser power. An alaysis of the fluorescence return expected from a local source of NO2 indicates that a plume of about 10 ppm could be detected at a range of several km. However, due to absorption effects, care must be used in the interpretation of signals emanating from local concentrations in excess of about 10 ppm. (Author abstract modified)

37156 **APTIC NO. 59511**

American Inst. of Chemical Engineers, New York

COMMUNITY AIR QUALITY INSTRUMENTATION. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 59p. 16 refs. (Also: A.I.Ch.E. Today Series: Air Pollution Control, New York)*

Community air quality sampling procedures and equipment are reviewed in relation to establishing and evaluating control measures, evaluating model parameters, and determining areas and time periods when hazardous levels of pollution exist in the atmosphere. Topics covered include: objectives of a sampling program, general considerations for sampling, a typical air sampling train, characteristics of primary sampling devices, methods of analysis and instrumentation currently available, automatic community air quality monitoring networks, and biological monitoring methods using plants as indicators.

37157 **APTIC NO. 59512**

American Inst. of Chemical Engineers, New York

EFFLUENT SAMPLING AND MONITORING. *New Hampshire Univ., Durham, Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 84p. 5 refs. (Reproduced from the A.I.Ch.E. Today Series Air Polluton Control, New York)*

A review is presented on methods and instrumentation for making gas quantity and velocity measurements and subsequent stack sampling (particulate and gaseous) once the flow rate and velocity profile in a duct have been obtained. Considerations covered include: obtaining a representative sample, errors due to non-isokinetic sampling, errors due to probe size or configuration, null-type sampling probes, and miscellaneous probe errors. Sampling train devices reviewed include: dry particulate collectors, absorption collectors and impingers, and freeze-out traps. Particle size determination is also discussed.

37158 **APTIC NO. 59513**

STACK MONOTORING. *New Hampshire Univ., Durham Center for Industrial and Institutional Development, Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, 69p. 64 refs.*

A review is presented on stack monitoring and stack effluent analysis procedures. Both manual observation methods (Ringelmann) and automatic opacity measuring techniques (light transmittance) are covered for stack-smoke monitoring. Abstracts of collection and analysis procedures (preparation for sampling, sampling, sample processing, analysis, and calculation) as related to gaseous constituents of stack emissions are provided for the following: ammonia and ammonium compounds; organic acids; aldehydes; formaldehydes; oxides of nitrogen; fluorides; sulfur oxides; hydrocarbons; orsat analysis (carbon dioxide, carbon monoxide, oxygen, and nitrogen); and chlorine and chlorine compounds. Proposed test methods of the Environmental Protection Agency are also presented.

1970

37159 **APTIC NO. 59458**

Derr, V. E. and C. G. Little

A COMPARISON OF REMOTE SENSING OF THE CLEAR ATMOSPHERE BY OPTICAL, RADIO, AND ACOUSTIC RADAR TECHNIQUES. *Appl. Opt., 9(9):1976-1991, Sept. 1970. 20 refs.*

The considerable utility of ultrasensitive microwave radar in atmospheric studies can now be augmented by lidar and acoustic echo-sounding techniques. The current and potential capabilities and limitations of these methods of remote atmospheric probing are discussed and the techniques are compared. A remote sensing facility consisting of these instruments probing the same volume of the atmosphere can measure many of the meteorologically significant parameters necessary to increase understanding of the structure and dynamics of the clear lower atmosphere, and provide the spatial and temporal density of measurements necessary for weather forecasting. (Author abstract)

1969

37160 **APTIC NO. 59778**

Kats, Gerrit and C. Ray Thompson

NOTE ON A SIMPLE DEVICE FOR MAINTAINING LIQUID LEVELS IN GREENBERG-SMITH IMPINGERS. *J. Air Pollution Control Assoc., 19(4):265, April 1969.*

A simple device has been developed for the maintenance of liquid levels in impingers used for the sampling of aerosols and soluble gases. Utilization is made of the weight of the impinger with liquid and a pressure sensitive device to maintain this weight by controlling a liquid flow to the impinger; a regular household recipe scale equipped with a calibrating screw and a range of 0-8 lb serves this purpose quite adequately. Weight loss occurring during evaporation causes a cam to lift, thereby allowing liquid to flow by gravity through tubing which enters the top of the impinger until equilibrium is reached. The calibrating screw is required fo adjustment since conditions such as weight of different impingers, flexibility of tubing, spring tension, and the required liquid level vary. The calibrating screw is usually set at the start of each sampling so that the liquid barely ceases to flow.

1968

37161 **APTIC NO. 59526**

Eichmeier, J.

THEORY AND RESOLVING POWER OF ASPIRATION TYPE MOBILITY SPECTROGRAPHS FOR ATMOSPHERIC IONS. *(Die theoretischen Grundlagen und das Aufloesungsvermoegen von Aspirations-Beweglichkeits-spektrographen fuer atmosphaerische Ionen). Text in German. Z. Geophys., vol. 34:69-86, 1968. 29 refs.*

The theoretical basis and resolving power of the aspiration-type mobility spectrograph is examined in terms of its use for measurement of atmospheric ions. Beginning with the known theory of the cylindrical aspiration condenser with undivided inner electrode, the theoretical current-voltage characteristic of a condenser with a single divided inner electrode goes through a maximum with increasing condenser voltage. The mobility spectrum of the ions which are drawn into the condenser is obtained by one differentiation of the decreasing part of the characteristic; two differentiations of the characteristic are necessary in the case of the undivided inner electrode. The current-voltage characteristic is identical with the ion mobility spectrum (ion mobility spectograph) if an aspiration condenser with a single divided inner electrode and ion gap is employed. The resolving power of the aspiration-type ion mobility spectrograph is defined by the ratio of the limit mobility of the whole condenser to the resolvable mobility interval. The resolving power becomes greater, the shorter the measuring electrode and the smaller the width of the ion gap chosen.

1967

37162 **APTIC NO. 60311**

Whitby, Kenneth T. and Richard A. Vomela

RESPONSE OF SINGLE PARTICLE OPTICAL COUNTERS TO NONIDEAL PARTICLES. *Environ. Sci. Technol., 1(10):801-814, Oct. 1967. 26 refs.*

The response of the Royco PC 200, Southern Research Institute (SRI), and Bausch and Lomb (B and L) single particle counters to nonideal but monodispersed aerosols was measured using polystyrene latex, dioctyl phthalate, India ink, and polystyrene aerosols. The indicated size of the absorbing India ink was 1/2 to 1/5 of the true size for all of the counters. The Royco and SRI counters, which accept light through only a small solid angle, indicated a considerable spread in size distribution for the India ink and polystyrene particles which had some surface roughness. The resolution on rough-surfaced aerosols was better for the B and L counter which accepts light through a much larger solid angle. Experiments were also performed which showed that high concentrations of subcountable-sized monodispersed DOP aerosols (e.g., 10,000/cu cm of 0.25 micron) generated a relatively monodispersed distribution of impulses pulses within the counting range. (Author abstract)

1963

37163 **APTIC NO. 59468**

Ingram, William T.

SAMPLING AND MONITORING INCINERATOR GASES. *In: American Public Works Assoc. Yearbook. Chicago, Ill., 1963, p. 214-217. 2 refs.*

Stack sampling and monitoring techniques for incinerator gases and particulates are reviewed. Sampling is divided into two major operations: the determination of the volume rate of flow of the gases in the stack and the collection of samples under conditions representative of the gases passing through the stack. Cross sectional area and velocity of gases must be determined to obtain volume rate of flow; and, since gas flow at temperatures found in incinerator stacks is highly turbulent, a traverse of the section is required. The test location in theory should be located in a section of straight duct with reasonably uniform flow. The sampling period should be at least 30 min for each test or longer to cover cyclic changes in charging the furnace. Monitoring of an incinerator stack in practice is somewhat limited by the equipment and instrumentation available. Methods in use include: subjective visual observation; use of a Ringelmann chart or smokescope; use of photoelectric units to estimate smoke opacity; continuous sample extracting and subsequent particle counting; and continuous sampling of a bypass stream for specific gases. Monitoring is currently used to primarily detect changes from sone predetermined base.

1962

37164 **APTIC NO. 59529**

Beyermann, Klaus

ANALYTICAL BEHAVIOR OF VERY SMALL AMOUNTS OF CHROMIUM. PART II. *(Das analytische Verhalten kleinster Chrommengen). Z. Anal. Chem., 191(5):346-369, 1962. 57 refs. Translated from German by Mark Plunguian, Techtan Corp., Glen Burnie, Md., NASA-TT-F-14142, 39p., March 1972.*

NTIS: N72-18543

The determination of nanogram to microgram amounts of chromium by microcolorimetry in capillary cuvettes, by emission spectrography, by flame photometry, by x-ray emission spectrography, by polarography, by biamperometric measurement on gold electrodes, and by activation analysis are described. Equipment, procedures, precision of measurement, operating variables, interferences, and errors are described.

1958

37165 **APTIC NO. 59946**

McMurray, C. S. and J. W. Redmond

PORTABLE MERCURY VAPOR DETECTOR. *Union Carbide Corp., Oak Ridge, Tenn., Nuclear Co., Atomic Energy Commission Contract W-7405-eng-26, Rept. 1188, Instruments TID-4500, 46p., March 14, 1958.*

A functional mercury vapor detector which is a portable, self-contained, survey instrument is described. It has a minimum range from 0 to .2 mg of Hg/cu m of air. The instrument is more convenient than commercially available instruments. Operation is not hampered by external power requirements. It may be easily carried and operated by one person. It reduces the cost of a survey by 60%. The instrumentation, calibration, maintenance, operating procedure, and field operation of the instrument, an ultraviolet spectrophotometer, are described.

AIR QUALITY MEASUREMENTS

1974

37166 **APTIC NO. 60112**

Benarie, M., T. Menard, and A. Nonat

COMPARISON OF THE 24H CONCENTRATIONS OF SO2 AND BLACK SMOKE INSIDE AND OUTSIDE A BUILDING AS A FUNCTION OF OCCUPANCY. *(Comparaison des concentrations de 24h de SO2 et fumees noires a l exterieur et a l interieur d un batiment en fonction de son occupation). Text in French. Atmos. Environ., 8(2):149-157, Feb. 1974. 6 refs.*

Systematic measurements of the 24-hour concentrations of sulfur dioxide and black smoke inside and outside of a school building as a function of occupation are described. The SO2 concentrations measured inside the building averaged 71% of the outside SO2 concentrations, while the inside smoke concentrations equaled 97% of the outside concentrations, regardless of whether the pupils were present or not. The correlation factors obtained for the inside and outside concentrations of SO2 and black smoke were 0.8969 and 0.9645, respectively. The differences between the inside and outside SO2 concentrations were statistically not significant in about one-third of all data pairs, and the difference between the averages of the smoke concentrations inside and outside was not significant in all cases.

37167 **APTIC NO. 60275**

Chatterjee, J. and F. E. Hargreave

ATMOSPHERIC POLLEN AND FUNGAL SPORES IN HAMILTON IN 1972 ESTIMATED BY THE HIRST AUTOMATIC VOLUMETRIC SPORE TRAP. *Can. Med. Assoc. J. (Toronto), 110(6):659-663, March 16, 1974. 16 refs.*

A Hirst automatic volumetric spore trap was used to identify the quantitative and seasonal incidence of atmospheric pollen and fungal spores in Hamilton, Ontario as part of an approach to the diagnosis and management of extrinsic rhinitis and asthma. Tree, grass, and ragweed pollens occurred in short, well defined seasons. Fungal spores greatly outnumbered pollen by 120 to 1 and occurred in long, ill-defined seasons. Included were large numbers of small basidiospores and ascospores which had previously not been detected in Canada. The latter have not been considered as potential allergens, and their clinical importance requires investigation. (Author abstract modified)

37168 **APTIC NO. 59409**

Hidy, G. M., P. K. Mueller, H. H. Wang, J. Karney, S. Twiss, M. Imada, and A. Alcocer

OBSERVATIONS OF AEROSOLS OVER SOUTHERN CALIFORNIA COASTAL WATERS. *J. Appl. Meteorol., 13(1):96-107, Feb. 1974. 25 refs.*

To characterize the background aerosol in air off the California coast, observations of suspended particles were made in the summer and fall of 1970 on San Nicolas Island (SNI), located about 130 km west-southwest of Los Angeles. Measurements of the physical and chemical properties of aerosols showed that the particles are a complex mixture of material from marine and continental origins. The Aitken nuclei population averaged 2400/cc, while particles more than 0.5 micron in diameter averaged 20-100/cc. The average total mass concentration of aerosol evaluated from 22 samples was 29.8 micrograms/cu m, but the refined fraction defined as particles less than 3.5 micron in diameter was 40% of this level. The averages of the chemical analysis of 13 samples revealed that 11% of the aerosol sampled at a 200 m height above the ocean was sea salt, while approximately 20% evidently was soil dust, as indicated by silicates. Over 25% of the suspended material was sulfate, nitrate, or ammonium, which are constituents believed to be produced primarily from gaseous transformation reactions in the atmosphere. More than 20% of the sampled material was volatile in nature and is believed to be partly water. The ratio for the average chlorine to sodium concentrations from the analysis of 13 different samples was 2.4 compared with 1.8 for sea water. This high ratio supports other limited results for unpolluted air from offshore sources taken in this geographical region. The anomaly is believed to be linked with chemical reactions transforming gaseous chlorine compounds into condensed material. Comparison was made between the aerosol sampled on San Nicolas Island and the natural background contribution of the Los Angeles smog aerosol, as estimated elsewhere assuming contributions solely from sea salt and soil dust. The calculated background and the composition of the SNI aerosol were qualitatively similar, with the principal differences showing in calcium, zinc, sulfate, and nitrate. Further comparison with aerosol analyzed from Pasadena illustrated the major contribution of localized pollution to the chemical properties of the particles, particularly in the concentrations of manganese, Ca, bromine, iron, lead, SO_4 ion, and NO_3 ion. (Author abstract)

37169 **APTIC NO. 60148**

Masek, Vaclav

MERCURY IN FLY DUSTS OF COAL AND PITCH COKING PLANTS. *(Quecksilber in Flugstaeuben von Kohlen- und Pechkokerien). Text in German. Staub, Reinhaltung Luft, 34(3):93-94, March 1974. 18 refs.*

Fifty stack dust samples from the preparation plant, batteries, and coal sorting plant of a hard coal coking plant and from the hard pitch preparation plant and batteries of a pitch coking plant were analyzed to determine the mercury content. In the dust from the coal coking plant the Hg content varied from 2.6 to 6.2 micrograms/g, and in the dust from the pitch coking plant it varied from 5.0 to 12.9 micrograms/g. In the air from working places in the coal coking plant there were traces of Hg content of up to 0.7 microgram/cum, while in the air from the pitch coking plant Hg traces of up to 0.3 microgram/cu m were found.

37170 **APTIC NO. 60179**

Maziarka, Stefan, Maria Borkowska, Zbigniew Misiakiewicz, Artur Strusinski, and Halina Wyszynska

AIR POLLUTION IN THE STREETS OF WARSAW IN RELATION TO SURROUNDING BUILDINGS. *(Zanieczyszczenie powietrza atmosferycznego na ulicach Warsawy o roznej zabudowie). Text in Polish. Roczniki Panstwowego Zakladu Higi, 25(1):1-8, 1974. 20 refs.*

Dust, aromatic polycyclic hydrocarbon, lead, carbon monoxide, and nitrogen oxide concentrations were measured in streets with heavy traffic and with different surrounding buildings. As a whole, the pollution level was high, however, it was moderate in relation to other cities. No evident effect of the type and arrangement of the surrounding buildings on the pollutant levels was noted. The pollutant concentrations were highest in underground tunnels with limited dispersion possibilities. The dust concentrations in streets averaged 0.24-0.52 mg/cu m, while the lead concentrations were of 0.8-2.5 micrograms/cu m. The average concentrations of benzo(a)pyrene, benzo(e)pyrene, benzo(g,h,i)perylene, pyrene, perylene, antanthrene, and coronene were in the respective ranges of 3.2-25.5, 1.5-12.2, 5.6-41.8, 1.9-25.9, 0.5-4.5, 0.6-9.7, and 1.4-7.7 nanograms/cu m. The nitrogen oxides concentrations, expressed in nitrogen pentoxide, averaged 0.07-0.21 mg/cu m. The CO concentrations ranged from 8.2 to 11.8 mg/cu m.

37171 **APTIC NO. 60292**

Simmonds, P. G., S. L. Kerrin, J. E. Lovelock, and F. H. Shair

DISTRIBUTION OF ATMOSPHERIC HALOCARBONS IN THE AIR OVER THE LOS ANGELES BASIN. *Atmos. Environ., 8(3):209-216, March 1974. 10 refs.*

Concentrations of four halogenated hydrocarbons used commercially as solvents, were measured throughout the air over the Los Angeles Basin during three days in the Fall of 1972. Average concentrations were 1.25 ppb for tetrachloroethylene, 0.65 ppb for trichlorofluoromethane, 0.37 ppb for 1,1,1-trichloroethane, and 0.22 ppb for carbon tetrachloride. Carbon tetrachloride showed the least variation in concentration throughout the entire basin, with more than 86% of all measurements falling within the range of 0.1-0.3 ppb. Generally, there was a progressive decrease in the concentrations of all four compounds on moving from the inland valleys to the coast. Diurnal studies at ground level locations and vertical profile measurements indicated that the adventitious labeling of the Los Angeles air mass with 1,1,1-trichloroethane, and tetrachloroethylene may allow these compounds to trace the movement of air within and away from the Los Angeles Basin.

37172 **APTIC NO. 59883**

Strauss, Reiner

AIR POLLUTION MEASUREMENTS ON THE FOUR SUNDAYS WITH CAR BANS. THE OVERALL IMPROVEMENT INSIGNIFICANT. *(Luftmessungen an vier Fahrverbots-Sonntagen. Gesamtverbesserung nur unbedeutend). Text in German. Umwelt (Duesseldorf), 4(1):18-19, 1974.*

In Bavaria, continuous and discontinuous measurements of air pollutants are being taken in the cities of Munich, Aschaffenburg, Augsburg, Ingolstadt, Nuremberg, and Wuerzburg. Discontinuous measurements are being taken regularly at certain points in those cities of sulfur dioxide, carbon monoxide, the oxides of nitrogen, total hydrocarbons, and dust. Continuous measurements are being taken of SO_2, CO, and the oxides of nitrogen. In these cities comparative measurements were taken on those Sundays with traffic bans in effect to determine the emissions caused by domestic heating and industry. Traffic density on those Sundays was negligibly low only in Munich; 400 automobiles per hour were still counted. Due to this relatively high traffic density, CO emissions of 2 and 4 ppm were measured in Munich, while in all other cities the CO concentration was below the detection limit. For NO_x, hydrocarbons, and dust, lower concentrations were measured, but some measured concentrations were hardly lower and some even higher than the comparative values. A graphical illustration of the normally measured concentrations and of those measured on traffic-free Sundays is given.

37173 **APTIC NO. 59949**

Tomingas, Rene and Arthur Brockhaus

EMISSION MEASUREMENTS ON SUNDAYS WITH DRIVING BAN ON A MEASURING STATION IN DUESSELDORF. *(Immissionsmessungen an Sonntagen mit Fahrverbot an einer Messstelle in Duesseldorf). Text in German. Staub, Reinhaltung Luft, 34(3):87-89, March 1974.*

On four consecutive Sundays at the end of 1973 when the Sunday driving ban was in effect, measurements of the particulate, lead, cadmium, sulfur dioxide, and benzo(a)pyrene concentrations were taken about 2 km south of the city center of Duesseldorf. The measuring station was 100 to 150 m away from a six-lane highway. The particulate air pollutants were sampled with a BAT unit over a period of 24 hours. They were retained by two filters operated in parallel, a glass fiber filter and a membrane filter. The particulate concentration was determined by the difference in weighing of the glass fiber filter, the benzo(a)pyrene concentration was determined subsequently with chromatographic and fluorescence methods. The heavy metals were analyzed after ashing by flameless atomic absorption. The SO2 was determined in a Woesthoff analyzer after oxidation to sulfuric acid and determination of the electric conductivity. The samplers were switched on at 3 am in the morning and switched off at 3 am the next day. For comparison, measurements were also taken on four consecutive Tuesdays and Thursdays with normal traffic. The well established fact of the great influence of meteorological conditions on the emission concentration could be confirmed again. The average concentrations of aerosols, SO2, and benzo(a)pyrene on Sundays were 20 to 70% higher than on the weekdays. Contrary to this, the concentrations of cadmium and lead were about 50% lower. The higher concentrations of the three air pollutants were obviously due to the lower average wind speed observed on the Sundays. Through consideration of the aerosol as a sum of many individual components and thus as a measurement parameter reflecting the influence of meteorological conditions, it becomes apparent that the lead concentration in the aerosol was significantly lower (50%) on the Sundays with driving band than on normal traffic days.

1973

37174 **APTIC NO. 59787**

Brandone, Alberto, Vera Maxia, and Edoardo Orvini

DETERMINATION OF ALUMINUM, ARSENIC, BROMINE, MANGANESE, ANTIMONY, SILICON, AND VANADIUM IN ATMOSPHERIC DUSTS BY NEUTRON ACTIVATION ANALYSIS. *(Determinazione mediante analisi per attivazione neutronica di Al, As, Br, Mn, Sb, Si e V nel pulviscolo atmosferico). Text in Italian. Chim. Ind. (Milan), 55(11):873- 876, Nov. 1973. 2 refs. (Presented at the Societa Chimica Italiana, Congresso Nazionale, 11th, Oct. 19-21, 1972.)*

Dust samples collected around a nuclear reactor in Pavia, Italy during the periods March 3 through April 8, 1970, and July 13 through 24, 1970, were analyzed for aluminum, arsenic, bromine, manganese, antimony, silicon, and vanadium content by neutron activation analysis and gamma spectrometry by means of germanium lithium crystal. The dust samples were collected on Schleicher and Schuell filters. The air volumes samples averaged 150 cu m. In air samples collected during the March-April period, the Al, V, Mn, As, Br, Sb, and Si content were in the respective ranges of 0.13 2.52, 0.02-0.16, 0.07-1.85, 0.002-0.028, 0.001-0.013, and 17-259 micrograms/cu m, respectively. The corresponding ranges for the July sampling period were 0.59-2.28, 0.01-0.04, 0.10-0.33, 0.004-0.023, 0.02-0.14, 0.002-0.022, and 37-133 micrograms/cu m, respectively. Compared to the July period, the elevated V contents in atmospheric dust during the March-April period were due to V emissions by domestic heating equipment.

37175 **APTIC NO. 59269**

Court, J. D.

AIR QUALITY--NOW AND THE FUTURE. *Aust. Refrig. Air Cond. Heat., 27(6):18-20, June 1973. (Presented at the AIRAH Conference, Sydney (Australia), 1973.)*

Methods for monitoring air pollutants and trends in their level of concentration are reviewed for the territory of New South Wales, Australia. Three indicators of air pollution which have been monitored on a regular basis at a large number of sites in N.S.W. for many years are: smoke concentration or suspended matter, sulfur dioxide, and dust deposition or fallout. The filter paper method with results expressed in units such as Coefficient of Haze has been universally adopted for measuring suspended particulates; the older method of measuring light transmission has recently been replaced with one measuring light reflectance. Sulfur dioxide is measured by absorption in hydrogen peroxide and back titration, while dust deposition is measured in standard deposit gauges. Smoke and sulfur dioxide measurements have indicated levels in the N.S.W. which are for the most part reasonably below the World Health Organization s recommended maximum limits, and a downward trend in Sydney and Newcastle has been noted for dust deposition. The carbon monoxide level which has been monitored continuously via nondispersive infrared spectrometry since 1970 appears to be unacceptably high in the Sydney central business district; until legal steps can be taken to control its emission from motor vehicles, building air intakes will have to be positioned as far as possible from traffic movements. Ozone measurements via chemiluminescent methods have also shown unacceptably high values and indicate that Sydney has a potential photochemical pollution problem.

37176 **APTIC NO. 60079**

Hincu, Iancu, Iolanda Enescu, Matei Macoveanu, and Virginia Mazilu

LEAD POLLUTION OF THE ATMOSPHERE IN THE AREA OF YASSY CITY. *(Poluarea cu plumb a atmosferei in aona orasului Iasi). Text in Romanian. Bul. Inst. Politeh. Iasi, 19(1-2):65-71, 1973. 12 refs.*

Traffic-generated lead air pollution was investigated in Yassy. The study was conducted in two areas (zones 1 and 2). Ten sampling locations were established in a polluted zone (zone 1) and four in the Botanical Gardens, where the atmosphere is protected from contamination by Pb. Lead concentrations at the 10 locations in zone 1 is under the legal limit with the exception of locations 5, 6, and 7, where motor vehicle traffic is intensive. No Pb was found in zone 2 (Botanical Gardens). Lead concentrations are unacceptably high in the Dimitrov, St. Spiridon, Unity Square, Red Bridge, Abator, and Pacurari sections of the city.

37177 **APTIC NO. 59622**

Holzworth, George C.

VARIATIONS OF METEOROLOGY, POLLUTANT EMISSIONS, AND AIR QUALITY. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 247-255. 9 refs. (Dec. 10-12, Paper ISA JSP 6701.)*

Examples are provided of temporal and spatial variations in pollutant emissions, atmospheric transport/diffusion, and air quality typical of specific locations in large urban areas in the United States. Very generally, pollutant emissions follow the cycles of human activity and energy utilization with rapid rises near the start of each day s activities, various degrees of decrease or increase around mid-day, increases in early evening, and declines late at night. Such energy utilization obviously depends on various characteristics of the weather, and the weather s transport/diffusion properties have a significant impact on air quality. At most places atmospheric dilution is greatest in the daytime and least at night but there are significant seasonal and regional differences. The overall effect on air quality of the usual diurnal patterns of emissions and dilution is that high concentrations at the beginning of a day s activities are mainly due to a morning surge in emissions; lower concentrations in the forenoon and afternoon are due to increased dilution and sometimes partly to decreased emissions; higher concentrations in the evening are caused by both decreasing dilution and increasing emissions; and low concentrations at night are mainly due to less emissions. Photochemical oxidants, which depend on solar radiation for their formation in the atmosphere, are an exception. Other pollutants considered here were sulfur dioxide, carbon monoxide, and nitrogen oxides. (Author summary modified)

37178 **APTIC NO. 60045**

Kitamura, Toshio, Tashohiko Ogura, Masafumi Kanematsu, and Sanae Murata

SURVEY ON AIR POLLUTION IN TOKUSHIMA PREFECTURE (PART 16) -- MEASUREMENT OF SULFUR OXIDES BY LEAD DIOXIDE METHOD. *(Tokushima-ken ni okeru taikiosen chosa (No. 16) -- Nisankanamari-ho ni yoru iosankabutsu nodo no sokutei kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:1-8, May 1973.*

Sulfur oxides were measured by the lead dioxide method in the industrial areas of Tokushima Prefecture. No concentrations were greater than 1.0 mg/day/100 sq cm on the average, except in some areas where greater concentrations were seasonally detected. The high concentration appeared during nearly all months of the year in the Onishi area south of Kitajima because the area was leeward of pollution sources. When the stack heights were increased in the area, SO2 concentrations decreased enormously.

37179 **APTIC NO. 60048**

Kitamura, Toshio, Toshihiko Ogura, Masami Katada, Masafumi Kanematsu, and Sanae Murata

SURVEY OR AIR POLLUTION IN TOKUSHIMA PREFECTURE (PART 18) -- DUST INVESTIGATION IN THE VICINITY OF CHROMATE AND FERROALLOY PRODUCING FACTORY. *(Tokushima-ken ni okeru taikiosen chosa (No. 18) -- Kuromusan oyobi feroaroi seizo kojo shuhen no funjin chosa). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:39-44, May 1973.*

Dust was measured near chromate and iron alloy manufacturing factories in Tokushima Prefecture using high and low volume samplers. Suspended particulates were greater near factories. Concentrations were less than the environmental standard of 100 micrograms/cu m. The average values of the six valent chromium compounds were less than 0.01 micrograms/cu m at each measuring place. The average values were less than the standard of 1.5 micrograms/N cu m as chromium oxide. The highest chromium concentration was 0.6 micrograms/cu m and the highest manganese concentration was 11.74 micrograms/cu m north of the factories due to the wind.

37180 **APTIC NO. 60049**

Kitamura, Toshio, Toshihiko Ogura, Masami Katada, Masafumi Kanematsu, and Sanae Murata

SURVEY ON AIR POLLUTION IN TOKUSHIMA PREFECTURE (PART 17 -- MEASUREMENT OF SULFUR DIOXIDE AND SUSPENDED PARTICULATE BY AIR POLLUTION AUTO-ANALYZER AND OBSERVATION BY ANEMOSCOPE. *(Tokushima-ken ni okeru taiki osen chosa (No. 17) -- Taikiosen jido sokutei sochi ni yoru aryusangasu oyobi fuyufunjin no sokutei kekka narabini jiki fuko-fusokukei ni yoru kisho kansoku kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Inst. Public Health Lab.), no. 12:9-37, May 1973.*

Sulfur dioxide and suspended particulates were measured in Tokushima Prefecture at various areas. The measurement methods used are described. Concentrations of SO2 at an elementary school were higher in the winter than in the summer; the area was polluted by SO2 and hydrogen sulfide from a rayon and a cellophane factory. At a high school, the SO2 concentration was higher in the summer dur to a thermal power station. Concentrations at both areas met the SO2 standard. Some areas had particulate concentrations greater than the standard.

37181 **APTIC NO. 60193**

Kitamura, T., T. Ogura, M. Katada, M. Kanematsu, and S. Murata

SURVEY ON AIR POLLUTION IN TOKUSHIMA PREFECTURE (NO. 19) -- MEASUREMENT OF DUST FALL. *(Tokushima-ken ni okeru taiki osen chosa (No. 19) -- Kokabaijin no sokutei kekka ni tsuite). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:59-62, May 1973.*

Tokushima prefecture measured the dust fall in and around alloy- manufacturing factories south of Tokushima city. The pH values at each measuring place generally ranged from 4 to 6, but Nakajima in Kawauchi town had the lowest value of 4.05 in November, suggesting that the area is affected by the acid gases such as sulfur dioxide, hydrogen sulfide, and hydrogen chloride, discharged from the factories in the area. The dust fall was less than 10 t/sq km/mon in nearly all measuring places except the top of the Tokushima bus office where it exceeded 10 t/sq km/mon in Feb. and June and the amount of rainfall was very heavy, the dust being rich in soluble substances. The insoluble substances here tend to be reduced from year to year. Tsunomine town is the next highest with respect to dust fall pollution, because in the vicinity of the area there are limestone factories.

37182 **APTIC NO. 60194**

Kitamura, T., T. Ogura, M. Kanematsu, and S. Murata

INVESTIGATION ON AUTOMOBILE EXHAUST POLLUTION IN TOKUSHIMA PREFECTURE (NO. 5). *(Tokushima-ken ni okeru jidosha haishutsugasu ni yoru kankyo osen chosa). Text in Japanese. Tokushima-ken Eisei Kenkyusho Nenpo (Ann. Rept. Tokushima Prefect. Public Health Lab.), no. 12:45-57, May 1973.*

Carbon monoxide from engine exhausts was continually measured at seven points along heavily traveled national roads in Tokushima Prefecture. The values of CO conformed to air quality standards in general, but comparatively high values were noted at a crossroads near a cultural center and in front of the prefectural office. The CO value in front of the prefectural office was about 4 ppm during the sampling period, but increased to 5 ppm 10 months later because of increased traffic. Hourly maximum values fell into two patterns: peaks appearing at morning and evening rush hours, and variable peaks with consistently higher values appearing during the day.

37183 **APTIC NO. 59823**

Mamuro, Tetsuo, Tadao Matsunami, Yatsuka Matsuda, and Akira Mizohata

RELATION BETWEEN METAL CONTENT AND AIRBORNE PARTICLE SIZE. *(Taiki fuyujin no ryudobetsu kinzoku sosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):534, Oct. 1973. (Presented at the Japan Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 261.)*

A thin polyethylene film was placed on each stainless dust trapping plate of Andersen Sampler, and the applicability of these films to instrumental neutron activation analysis was examined. Samples were taken on the roof garden of the Osaka Prefectural Radiation Research Inst. between April 21 and May 5, 1973, for 336 hr, at the speed of 28.3 l/min. The analysis results of one-hour irradiation by thermal neutron activation are presented in a graph. The elements quantitated on all particle levels were: iron, zinc, sodium, chromium, bromine, cerium, lanthanum, arsenic, cobalt, thorium, caesium, scandium, samarium, and antimony. Those that tended to increase in quantity with the increase of particle size were Fe, Ce, Th, Sc, and Sm, and those with the reverse tendency were An, Br, As, Se, and Sb. Particle sizes seemed to have no effect on the content with Na, Cr. Co, and Cs.

37184 **APTIC NO. 59635**

Mogi, Shoichi, Shizunori Imazeki, Kunihiro Goi, and Fumiko Yamada

SOME FEATURES OF PHOTOCHEMICAL SMOG OF SAITAMA. *(Saitama-ken ni okeru kokagaku sumoggu no tokucho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):575, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 298.)*

The characteristics of photochemical smog frequency in Saitama prefecture are as follows: when high concentrations of 0.15 ppm and 20 ppm are compared, the frequency of 0.15 ppm is a little higher on Sundays compared to weekdays, but the 0.20 ppm frequency is approximately the same for all week; for the period of April 1 and August 22, 1973, there were 41 occurrences of 0.15 ppm, and 25 of more than 0.20 ppm, of which six times were more than 0.25 ppm; the frequency of 0.20 ppm in July was extremely high; the appearances of 0.20 ppm concentrations are very localized compared to the appearances of 0.15 ppm; the high concentration of 0.25 ppm frequently appeared in eastern Saitama; the patterns of formation and movement (transportation) of oxidants are very similar to dusts, which are affected by wind direction and speed. In the area of 40 km zone from Tokyo Bay, special monitoring net work was established and in the area covering 50 km from the Bay, mobile monitoring cars were provided.

37185 **APTIC NO. 59605**

Plassmann, Eberhard

STUDY OF AUTOMOTIVE EXHAUST EMISSIONS IN CITIES AND HIGHLY INDUSTRIALIZED AREAS AS EXEMPLIFIED BY COLOGNE. *(Recherches sur les emissions de gaz d echappement provenant du traffic automobile, dans les villes et les zones fortement industrialisees, sur la base exemplaire de la ville de Cologne). Text in French. Tribune CEBEDEAU (Centre Belge. Etude Doc. Eaux), 26(360):418- 430, Nov. 1973. 8 refs.*

Factors influencing the exhaust emissions were studied and actual carbon monoxide, nitric oxide, and hydrocarbon emissions along major thoroughfares in and around Cologne were measured. While the specific CO and HC emissions per km remain practically unchanged at speeds above 40 km/h, the NOx emission slightly increases. After a study of the distribution of the passenger cars according to their make, engine power, and year of production, as well as of the modes of driving and of the traffic patterns, CO, HC, and NOx measurements were performed along a busy section of a thoroughfare in Cologne. While a close relationship between the CO, NOx, and HC emissions and the traffic density was established, the disproportionate increase in the CO concentration during the afternoon rush hours on weekdays was partly due to a considerable decrease in the average speed. Both the traffic density and the motor vehicle-generated emissions were lower during the weekends than they were on workdays. Calculations revealed that the shares of automotive exhaust emissions in the total CO, NOx, and HC emissions in the Cologne area are 49%, 10%, and 6%.

37186 **APTIC NO. 59252**

Samuels, Harris J., SuzAnne Twiss, Evan W. Wong, Harmon Wong-Woo, Peter K. Mueller, John A. Maga, and George J. Taylor

VISIBILITY, LIGHT SCATTERING AND MASS CONCENTRATION OF PARTICULATE MATTER. *California State Air Resources Board, California Tri-City Aerosol Sampling Project and the California State Dept. of Public Health, Air and Industrial Hygiene Lab., 60p., July 1973. 13 refs.*

Mass concentration aerosol data was collected using two-stage and high volume samplers, light scattering data was collected with an integrating nephelometer, and prevailing visibility was observed at sites in Los Angeles, Oakland, and Sacramento from Jan. 1970 to March 1971. Visibility and light scattering correlated highly, and relations between these parameters agreed with theory. Visibility was an important index of air quality; because there were operational difficulties in acquiring prevailing visibility data, the integrating nephelometer was recommended as a useful instrument for routine air quality monitoring. Mass concentration correlated with light scattering and visibility. Expressions relating mass concentration to light scattering were not precise, however, and preclude the use of mass concentration data to describe visibility. In all three urban locations, the mass fraction of particulate matter in the refined range, i.e., particles nominally smaller than 3 micron in diameter, ranged from an average of 53% to 57% and for 24-hour samples was essentially independent of variations in total mass concentrations. (Author abstract modified)

37187 **APTIC NO. 60280**

Sharma, V. P., H. C. Arora, S. N. Chattopadhaya, and Tapan Routh

A LIMITED STUDY OF AIR QUALITY AT KANPUR. *Indian J. Environ. Health, 15(2):133-143, April 1973. 5 refs.*

Results are presented from a limited air quality study of the city of Kanpur, a populous and industrialized section in the State of Uttar Pradesh, for the years 1970-1972. Parameters estimated on a monthly basis were: total dust fall rate, suspended particulate matter, sulfation rate, nitrogen dioxide, sulfur dioxide, and ammonia. Total dust fall reached a minimum of 280 tons/sq mi/mo for May of 1970, a period when dusty winds are a regular feature. Suspended particulate matter also reached a high (1200 micrograms/cu m air) for the same month. The highest value for sulfation rate was 1.2 mg of SO2/100 sq cm/day. Nitrogen dioxide concentrations were lowest during the time periods 12 noon to 4 pm and 8 am to 12 noon; during other periods, nitrogen dioxide ranged between 10-20 microgram/cu m air. Values for sulfur dioxide recorded for different periods of different months ranged from 40-66 microgram/cu m air, while average monthly concentrations of ammonia recorded during different periods of a day ranged between 20 and 200 microgram/cu m air.

37188 **APTIC NO. 59965**

Shibata, S., K. Hayashi, K. Koike, I. Kojima, T. Takanashi, K. Ishida, K. Nakamura, and S. Yasuno

RELATION BETWEEN OXIDANTS CONCENTRATIONS AND OTHER ATMOSPHERIC POLLUTANTS. *(Okishidanto nodo to ta no taiki osen busshitsu to no kankei ni tsuite). Text in Japanese. Aichi-ken Kogai Chosa Senta Shoho (Repts. Environ. Pollut. Res. Cent., Aichi Pref.), no. 1:7-13, March 1973. 6 refs.*

Relationships between the oxidant concentration and those of other pollutants were measured in Aichi and six patterns emerged. In an industrial area where the temperature was around 20 C, nitrogen dioxide and sulfur dioxide concentrations are higher at night and decrease as oxidants increase during the day. Away from the factories, in the summer, oxidant peaks appeared between 11-12 am and SO2 between 2-3 pm. Nitric oxide and NO2 peaks were variable. In areas where traffic was light, summer oxidant peaks appeared at noon and NO and NO2 concentrations were low and constant. In a non-industrial area all pollutant concentrations were low and the oxidant peak appeared at noon. Another pattern was the night smog type in which the oxidants increased with NO at night, especially in wintertime. In heavy traffic areas, the effects of engine exhausts increased both NO and oxidant concentrations. A high oxidant concentration appeared in Nagoya city when the atmospheric pressure was high, when the wind changed direction, and when the inversion layer was disturbed.

37189 **APTIC NO. 59290**

Uchiyama, Masahiro, Fumiko Hayashi, Yoshitaka Shimada, Isao Takahashi, Yuzuru Saito, and Yoshitsugu Shinozaki

AIR POLLUTION RESEARCH BY FILTER PAPER METHOD. *(Arukari roshi ni yoru taiki osen chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):500, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 230.)*

The state of air pollution in Gunma prefecture was investigated by the alkaline filter paper method. Continuous measurements of sulfur oxides, nitrogen oxides, and chlorine ion were taken in industrial Shibukawa and the less polluted Maebashi for 1 yr. In Maebashi, alkaline filter paper screen boxes were installed at 13 elementary schools, and lead dioxide candles in shelters were used at 15 locations in Shibukawa. Sulfur trioxide in industrial areas of Shibukawa averaged at 0.25p mg/day 100 sq cm; in the industrial area of Maebashi, 0.079 mg/day/100 sq cm; in the suburbs of Shibukawa at 0.02 mg; and the outskirts of Maebashi, 0.055 mg. The nitrogen dioxide measurements in the industrial areas of Shibukawa was 0.022 mg, and in a similar area of Maebashi, 0.010 mg. Cl ion in the industrial areas of Shibukawa was 0.012 mg and in Maebashi, 0.006 mg. The seasonal variations of SO3 showed similar patterns in the two cities with lower measurements in summer and higher in winter. But there was a drastic increase in May, in Shibukawa. The seasonal fluctuations for NO2 were clearer and more similar, with more pronounced higher measurements from October to January. The Cl ion increased for both cities between Feb. and May.

37190 **APTIC NO. 59995**

Winkler, Raimund

DETERMINATION OF IRON-55 IN AIR FILTER AND DEPOSITION SAMPLES BY X-RAY SPECTROMETRY. *(Roentgenspektrometrische Bestimmung von Eisen-55 in Luftstaub- und Niederschlagsproben). Text in German. Fresenius Z. Anal. Chem., 267(4):261-266, 1973. 22 refs.*

Iron-55 was determined in monthly collected air filter and deposition samples at Neuherberg near Munich since March 1970 and January 1971, respectively. After ashing, Fe was separated by extraction with diisopropyl ether. Interfering radionuclides were removed by an ion-exchange step. Finally, Fe was electrodeposited on a copper disc and the x-ray spectrum was measured using a proportional counter or a silicon(lithium) detector. Average activity concentration in the air at Neuherberg was 1.0 fCi/cu m in 1970, 1.2 fCi/cu m in 1971, and 0.36 fCi/cu m in 1972. The annual ground deposition was 697 pCi/sq m/yr in 1971 and 178 pCi/sq m/yr in 1972.

37191 **APTIC NO. 59270**

Municipal Pollution Control Bureau, Yokohama (Japan)

REPORT ON THE 1971 INVESTIGATION OF AIR POLLUTION IN YOKOHAMA. *(Yokohama-shi taiki osen chose hokoku). Text in Japanese. Rept. 12, 116p., Jan. 1973.*

The 1971 report of the Yokohama Municipal Pollution Control Bureau includes the concentrations of settling particles, sulfur oxides (measured by lead dioxide and electroconductivity methods), environmental standards, heavy pollution warnings and countermeasures, photochemical pollution, carbon monoxide, and heavy metals in suspended particulates. The 1971 measurements of settling particles were down to the level of the minimum average in 1964 and seemed to be decreasing even more. The level of nonsoluble settling particles have reduced since 1966 and is at a plateau. Up to 1968, sulfur oxides tended to increase; since then, the measurements have decreased every year, especially in industrial areas, as a result of stringent emission standards. Photochemical smog warnings were issued eight times during the year, and physical damages were reported in 27 separate incidents, involving 2337 victims, of which 1721 (73.6%) were junior high school pupils, and 498 (21.3%) were elementary schoolchildren. The most prevalent symptoms were pains in the eyes and throats, but breathing difficulty, nausea, headache, and numbness were also reported. The ratio of the environmental concentrations failing to pass the CO standards was 0.4 and 0.9% for 8-hour values and 10.9% and 16.2% for 24-hour values at a busy intersection.

37192 **APTIC NO. 59394**

Dept. of Trade and Industry, Great Britain, Warren Spring Lab.

DEPOSIT GAUGE AND LEAD DIOXIDE OBSERVATIONS: OCTOBER 1972-MARCH 1973 WITH YEARLY AVERAGES. (FINAL REPORT). *29p., 1973 (?).*

An alphabetical listing is provided for deposit gauge and lead dioxide data for sulfates recorded at numerous sites in Great Britain. Undissolved deposit data is recorded as the amount of insoluble material collected in the British Standard Deposit Gauge expressed as mg/sq m/day. Additional analytical data for deposited matter includes pH of the rainwater, sulfide-soluble constituents, ash, total dissolved matter, and various ions in solution (calcium, chloride, and SO4). The rate of sulfation of the standard PbO2 cylinder is expressed as mg sulfur trioxide/100 sq cm PbO2 surface/day.

37193 **APTIC NO. 59616**

Japan Environmental Agency

AIR POLLUTION IN JAPAN, 1973. A SURVEY OF THE 1972 MEASUREMENTS BY ALL-JAPAN CONTINUOUS MONITORING NETWORK. *(Nihon no taiki osen jokyo - Showa 47nendo zenkoku joji kanshi sokuteikyoku ni okeru sokuteichi to sono gaiyo). Text in Japanese. 745p., 1973.*

An air pollutant survey of 248 Japanese cities in 1972 for seven major contaminants, including sulfur oxides, nitrogen oxides, carbon monoxide, and oxidants, is reported. The sulfur oxide standard of less than 0.05 ppm, measured hourly on a maximum annual average, was met by 95% of the cities checked, although only 35 cities met the new standard of less than 0.04 ppm (daily average measured hourly). Nitrogen oxides were observed in 72 cities, and only Matsue met the standard of 0.02 ppm/hr (maximum daily average). Osaka, the most heavily polluted by nitrogen dioxide, had a maximum annual average of 0.049 ppm for this gaseous pollutant. Most of the cities in the Tokyo Yokohama, Nagoya, and the Osaka-Kyoto-Kobe areas were polluted by NO2 several times more than the tolerance level.

37194 **APTIC NO. 59805**

Association pour la Prevention de la Pollution Atmospherique, Comite Regional de Caen

STUDY OF THE AIR POLLUTION IN THE CAEN AGGLOMERATION DURING THE 1971-1972 PERIOD. *(Etude de la pollution atmospherique dans l agglomeration Caennaise pendant l anne 1971-1972). Text in French. Pollut. Atmos. (Paris), 15(60):421-429, Oct.-Dec. 1973.*

Results of systematic measurements of the acidity (sulfur dioxide), and black smoke concentrations, as well as of dust fall measurements performed in the Caen agglomeration during the period from Oct. 1971 to Sept. 1972 are presented. The monthly averages of the SO2 concentrations measured during Oct., Nov., Dec., Jan., Feb., March, April, May, June, July, August, and Sept. were in the respective ranges of 38-75; 23-65; 31-80; 32-79; 20-71; 29-67; 17-60; 15-25; 21-96; 25-112; 25-75, and 33-59 micrograms/cu m. The monthly averages of the black smoke concentrations measured during the same months were 32-46; 31-43; 35-59; 32-69; 25-48; 23-41; 13-14; 8-13; 10-15; 14-21; and 28-40 micrograms/cu m. The averages of the SO2 and black smoke concentrations were in the respective ranges of 34-62 micrograms/ cu m and 35-53 micrograms/cu m in winter, and in the ranges of 30-65 micrograms/cu m and 16-

20 micrograms/cu m in summer. The settling dust measurements revealed 1.2-3.1 g/sq m/wk in winter, and 1.1-5.6 g/sq m/wk in summer.

37195 **APTIC NO. 59963**

Japan Public Health Assoc.

INVESTIGATIONS ON MOVEMENT OF ATMOSPHERIC PCB. *(Taikichu no PCB no dotai ni kansuru choso kenkyu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 26:49-59, Nov. 1973.*

A committee for studying atmospheric polychlorinated biphenyls was established and the concentration of PCB in various environments was determined. The PCB were collected with a diagram vacuum pump, glass fiber filters with 50%, 20%, and 10% glycerin solutions, and a bottle of n-hexane. The collected PCB were analyzed by gas chromatography. The untreated gases of two PCB incinerators and similar flue gases after adsorption by activated carbon and scrubbing were sampled. A small quantity of PCB were emitted from the waste incinerators, ranging from trace amounts to 8 micrograms/cu m. Less than 0.05 microgram/cu m were detected in the air of cities.

37196 **APTIC NO. 59980**

Hyogo Prefectural Government (Japan)

REPORT OF 1972 ENVIRONMENTAL ATMOSPHERE SURVEY FOR ITAMI AREA. *(Showa 47 nendo itami chiiki kankyo taiki chosa hokoku). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 25:115-136, Oct. 1973.*

Oxides of sulfur; nitrogen dioxide, nitrogen monoxide, carbon monoxide, hydrocarbons, total chlorine, dust, ammonia and suspended particulates were sampled at three sampling points, two of which were in the Osaka International Airport and the third immediately outside the Airport. Meteorological conditions including wind direction, wind velocity, temperature, and humidity were measured hourly during the survey period at the Osaka Airport Meteorological Observatory. The samplers used were gas samplers, hi-vol air samplers, and cyclone-type low-volume air samplers. The 5-day average concentrations of the air pollutants are 0.050 ppm SOx, 0.041 ppm NO2, 0.039 ppm NO, 3.7 ppm CO, 1.16 ppm HC, 16.8 micrograms/cu m for total Cl, and 13.8 micrograms/cu m for NH3 at one measuring site. The suspending dust was 108 micrograms/cu m, and was composed of 0.364 ppm, zinc 0.336, cadmium 0.0066, manganese 0.114, nickel 0.0082, and vanadium 0.0618. Hourly data are given.

37197 **APTIC NO. 60249**

Nagano Research Inst. for Health and Pollution (Japan)

AIR POLLUTION INVESTIGATION BY A POLLUTION-MEASURING CAR, AOZORA. *(Kogai sokuteisha Aozora ni yoru taiki osen chosa). Text in Japanese, Rept. 111, 213p., July 1973.*

Sulfur oxides, suspended particulates, carbon monoxide, nitrogen oxides, hydrocarbons, and oxidants have been measured at 12 sites in Nagano Prefecture, including streets, crossroads, and recreation areas, by a car with automatic measuring equipment. Air quality measurements were correlated with amount of traffic, micrometeorology, topographical features, and compared to the applicable emissions standards. Pollutant values at recreational and industrial sites were very low, although NOx and SOx were somewhat higher when the wind crossed industrial emission sources. The nitrogen dioxide concentrations, however, exceeded the emission standard at highways and crossroads. Amounts of CO and nitric oxide correlated well with the number of cars at the measuring points. Sulfur oxides and NO2 closely related and the daily concentration of these pollutants was lower than expected in relation to the amount of traffic. Pollutant values were higher during morning and evening rush hours.

1972

37198 **APTIC NO. 60098**

Arai, M., M. Muramatsu, Y. Kakizaki, T. Uehara, J. Iwamoto, K. Honma, M. Honma, R. Ishida, T. Osaka, A. Isai, K. Takeuchi, S. Okamoto, H. Emoto, A. Nakao, M. Saito, H. Suzuki, S. Koyama, K. Sekine, and S. Nakahira

PROBLEMS AND EXAMPLES OF BUILDING ENVIRONMENTS. *(Biru kankyo no mondaiten to sono jirei). Text in Japanese. Tokyo-to Eisei yoku Gakkai-shi (Rept. Tokyo Public Health Studies), no. 50:108-109, Oct. 1972.*

Many buildings contain more polluted air than allowed by law The most unsatisfactory concentrations are those of carbon dioxide and carbon monoxide. Generally, the amount of suspended particulates is large in offices. Carbon monoxide concentrations are high in department stores. Many buildings lack ventilation systems. Other problems with sanitation in building are described including waste disposal and rats.

37199 **APTIC NO. 59488**

Duffaud, J., F. Merkez, L. Truffert, M. Favart, and P. Chovin

DETERMINATION OF LEAD IN ATMOSPHERIC DUST IN PARIS. FIRST RESULTS OF A SIX-MONTH STUDY. *(Dosage du plomb dans les poussieres atmospheriques a Paris. Premiers resultats d une etude de six mois). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 12p., (May 3-5.)*

Results of a six-month investigation of the lead content in the atmospheric dust collected in Paris at 6 different sites between July and December, 1971, are presented. The dust samples, taken by Millipore HAWP 04700 white filters, were incinerated, after which the Pb content in the ashes was determined by the colorimetric method with dithizone. The Pb contents in the dust samples were generally fairly low, exceeding 10 micrograms/cu m only exceptionally. The average Pb contents in dust samples collected in July, August, September, October, November, and December were in the respective ranges of 0.9-3.9; 0.5-2.8; 1.2- 4.3; 2.0-6.5; 1.5-5.1, and 1.3-4.4 micrograms/cu m. There appears to be a relationship between the atmospheric dust Pb content and the traffic density, as demonstrated by the very high Pb contents during the subway strike. Also, reduction in the atmospheric Pb contents with increasing altitude and increasing distance from major highways and busy streets was observed.

37200 **APTIC NO. 59551**

Grandjean, E.

RECENT STUDIES ON AIR POLLUTION AS A FUNCTION OF TRAFFIC. *(Recentes etudes de la pollution atmospherique en foncyion de trafic). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 12p., 5 refs. (May 3-5.)*

The dust fall, the dust 3,4-benzo(a)pyrene content, sulfur dioxide, carbon monoxide, nitrogen dioxide, and formaldehyde concentrations in the air of Zurich, Baden and their suburbs were studied from 1963-1967. The SO2 concentrations were much higher in winter than they were in summer, which indicates the effect of domestic heating on the SO2 concentrations. The CO concentrations were also higher in winter than they were in summer. However, the higher concentrations in winter were due to increased frequency of traffic jams rather than to domestic heating. The increased concentrations of NO2 measureed in winter (0.028 ppm against 0.018 ppm) was probably due to domestic heating. The formaldehyde concentrations were higher in summer than they were in winter due to photochemical reactions. Nearly linear correlations between the SO2 concentration and the number of inhabitants over 500,000 in big cities were established. However, no such correlation for the CO and NO2 concentrations was obtained, which indicates that these concentrations are primarily determined by the number of vehicles per unit of space.

37201 **APTIC NO. 59948**

Hartkamp, Heinrich

POLLUTION MEASUREMENTS FOR MONITORING THE AIR IN NORTH RHINE/ WESTPHALIA. *(Imissionsmessungen zur Luftueberwachung im Lande Nordrhein-Westfalen). Text in German. Mitt. Forst. Bundesvers., vol. 97:45-52, 1972. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

For several years, measurements have been made over an area of about 6000 sq km to determine the pollution over industrial centers on the Rhine and Ruhr. The measuring points are arranged in a 1 km square grid and are distributed at random in relation to the position of the pollution sources; the pollution levels per unit are given per sq km. Sets of about 100 individual measured values are used to evaluate each area: in programs I (dust deposition) and III (sulfur dioxide), these values come from the corners of the area being evaluated; and in program IV, they come from sampling measurements and addition points. The pollution parameters I1 and I2 are derived from these collected values. Program II was set up to aid in the recognition of acute meteorologically-caused danger situations; it also enables prediction with regard to long-term trends. Both manual discontinuous and automatic measuring methods are used, with the technique of discontinuous measurement in particular, have reached a high state of development. The following pollutants are, or can be, measured: hydrogen fluoride, hydrogen chloride, ozone, hydrogen sulfide, sulfur dioxide, ammonia, nitrogen monoxide, nitrogen dioxide, hydrogen phosphide, carbon monoxide, carbon dioxide, carbon disulfide, phenol, formaldehyde, hydrocarbons, polycyclic aromates, gaseous organic substances, dust, aerosols (long and short term measurement), lead and zinc in dust, and lead in aerosols.

37202 **APTIC NO. 60023**

Inoue, Masayoshi, Akihiro Sakamoto, and Toshio Konishi

THE RESULTS OF EXAMINATIONS ON ATMOSPHERIC POLLUTION IN WAKAYAMA PREFECTURE. *(Wakayama-ken no taiki osen chosa seiseki). Text in Japanese. Wakayama-ken Eisei Kenkyusho Nenpo (Wakayama Inst. Pub. Health Ann. Rep.), no. 19:94-99, Sept. 1972. 2 refs.*

The amount of dust fall was measured in Wakayama City. Average values were 10.62 and 10.58 tons/sq km/mo in 1969 and 1970, respectively. The highest value was near a metal factory. The average values there were 19.17 and 21.62 tons/sq km/mo in 1969 and 1970, respectively. The average values in Kaianan City were 5.99 and 5.31, respectively. The average sulfur dioxide concentrations in Wakayama, Kainan, Shimotsu, and Arita cities and an orange-growing area were 0.82, 0.46, 0.63, 0.53, and 0.33, respectively. The highest values were in Wakayama City; they were 1.39 and 1.22 in 1969 and 1970 respectively. The SO2 concentrations were decreased in Wakayama Prefecture.

37203 **APTIC NO. 59777**

Isaksson, Goran

DUST EMISSIONS FROM A STEELWORKS: AN INDUSTRY BRANCH REPORT. *(Dammsituationen vid stalverk: En branschrapport). Text in Swedish. Arbetsmedicinska Institutet, Solna, Sweden, Rept. T 501/72, 36p, 1972. 23 refs.*

Dust concentrations occurring at different work places and during different operations were measured by means of stationary and portable gravimetric instruments in 20 steel works in Sweden. The dust concentrations were highest during such operations as lining, lining removal, and lining preparation. The average dust concentrations measured during such operations reached 25.1-31.9 mg/cu m, with dust indices of 3.8-7.0 against an allowable dust index of 1.0. Dust indices slightly over unit were measured in foundries, while the dust concentrations measured at the furnaces averaged 4 mg/cu m, corresponding to dust indices of 0.5-0.6, with the average quartz content being 6-9% against an overall average of 14-15%. The extrema of the quartz contents in dust were nearly 50% and less than 0.5%. Cristobalite and tridymite occurred but in a few dust samples. In general, the dust concentrations were usually low with a few work places characterized by high concentrations. The low dust concentration is a result of good general ventilation, e.g., thermal ventilation, while ventilation by dilution has little effect on the dust concentration near the emission sources. Further abatement of the dust emissions will be possible by encapsulation and punctiform ventilation for the different emission sources.

37204 **APTIC NO. 60230**

Sakamoto, Akihiro, Masaka Inoue, and Katsumi Hayashi

THE RESULTS OF EXAMINATIONS ON THE ACTUAL STATUS OF SUSPENDED PARTICULATES IN WAKAYAMA CITY. *(Wakayama-shi ni okeru fuyu funjin no jittai chosa kenkyu kekka ni tsuite). Text in Japanese. Wakayama-ken Eisei Kenkyusho Nenpo (Wakayama Inst. Pub. Health Ann. Rept.), no. 19:83-89, Sept. 1972. 7 refs.*

Air quality measurements were made in an agricultural, residential, and chemical and steel-working industrial areas between Dec. 27, 1970 and Jan. 22, 1971. The sample was collected with a high-volume air sampler and a cascade impactor. High- volume sampling was done at 10 am and cascade sampling was done at the same time the following week. The total amount of suspended particulates was highest in the steel-making area, followed by the chemical plant, the residential area, and the agricultural area, in that order. Metallic components was highest in the steel-making area. The concentration of cadmium was almost the same in various areas. Amounts of soluble sulfate ion and nitrate ion were rich in all the areas, especially in the agricultural area. The content of benzene-soluble materials was the highest in the chemical plant area, followed by steel-making, residential, and agricultural areas, in that order. Relatively good correlation was found between the contents of sulfate ion and the total amount of suspended particulates. Sulfate ions are possibly present in all the fine suspended particulates, together with lead and cadmium.

37205 **APTIC NO. 59950**

Institut National des Industries Extractives (Belgium)

ENVIRONMENT. *(Environnement). Text in French. p. 32-37, 1972.*

The environmental studies and air pollution monitoring activities by the Institut National des Industries Extractives in Belgium are surveyed. A monitoring network for the measurement of settling dust in the Liege industrial basin was set up in 1971. The mean value of the dust fall, determined by Owen s gauges, was between 200 and 400 mg/sq m/day. The dust fall values obtained for the neighborhood of power plants, cement works, and especially of iron and steel works, were far above the average. The percentage of the soluble fraction of thy dust samples collected was dependent on the site of the sampling; i.e., it reached 50% in cement work dust, 12% in dust samples from iron and steel works, and 32% in a typical urban dust. For prolonged dust fall measurements, vaseline-coated plaques should be abandoned in favor of gauges, since the former yield considerably lower values due to leachout by precipitation of the soluble dust fraction. Another network was installed for the monitoring of the sulfur dioxide and smoke concentration in the framework of a national network. A gas-chromatographic method for the quantitative analysis of 3,4-benzo(a)pyrene was developed.

1971

37206 **APTIC NO. 59687**

Sofuku, Masataka, Kinji Nakano, Hiroshi Yamasaki, and Rinko Nagata

AIR POLLUTION BY NITROGEN OXIDES AT VARIOUS LEVELS AT TOKYO TOWER. *(Tokyo tawa ni okeru chisso sankabutsu no kodobetsu henka ni tsuite). Text in Japanese. Tokyo-to Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 2:20-27, 1971.*

The variation in nitrogen oxide concentrations at various altitudes was investigated by taking measurements of nitric oxide, nitrogen dioxide, and suspended particulates lead particles at Tokyo Tower at the levels of 25, 125, and 225 m. In summer, measurements were taken at every hour for 14 days in August, and in winter similar measurements were taken in December. In summer, a 32 chamber continuous sampler with 10 ml of Saltzman absorbent was used at the rate of 0.3 m/min. In winter, an electrochemical automatic meter using 20 ml absorbent at the same flow rate was applied. Suspended particulates were sampled by hi-vol sampler for 24 hrs. The NOx were analyzed by colorimetry. In summer, NO maximums at three levels were, from the lower level, 30, 9, and 7.8 pphm, and averages were 4.6, 2.1, and 2.2 pphm; NO2 maximums were 20, 9.6, and 19 pphm, and averages were 5.5, 3.5, and 5.1 pphm. In winter, NO maximums were 5, 36, and 26 pphm, and averages were 9.2, 5.9, and 2.5 pphm; NO2 were 18, 13, and 16 pphm, and averages were 4.5, 3.9, and 3.2 pphm. For this investigation, it became clear that NO2 concentrations were higher than those of NO in summer and in winter, NO concentrations were higher than NO2. In winter, both NO and NO2 levels tend to decrease with the increase of altitude; in summer, there was no clear-cut trend, probably due to the instability of atmosphere. In winter, NO and NO2 correlations with Pb were difficult to determine, but seemed to exist. In summer, high concentrations appeared with southerly winds and during calms. In winter, the wind direction had no clear-cut relationship. The NO tended to be high when wind velocity was weak, but NO2 did not necessarily behave in the same way.

1969

37207 **APTIC NO. 59240**

Hoffman, Alan J.

DALLAS-FORT WORTH METROPOLITAN AIR POLLUTANT EMISSION INVENTORY. *National Air Pollution Control Administration, Durham, N. C., Air Quality and Emission Data Div., Office of Air Programs Rept. APTD-0695, 43p., April 1969. 7 refs.*

The emission inventory of the Dallas-Fort Worth metropolitan area is presented. Total emissions of sulfur oxides, particulates, carbon monoxide, hydrocarbons, and nitrogen oxides were estimated with respect to source type, season, and geographical distribution. The major pollution sources included transportation (motor vehicles aircraft, and railroads), industries, (lead plants, refineries, sulfuric acid plants, asphalt and concrete batching iron and steel foundries, cement industries, sand and gravel industries, and grain processing) steam-electric power plants, domestic heating, solid waste disposal, open burning, dumps, and incineration. Point source emissions collectively accounted for 65% of the SOx, 77% of the particulates, 7% of the CO, 5% of the HC, and 24% of the NOx.

1965

37208 **APTIC NO. 59476**

Siksna, Reinhards and Joseph Eichmeier

CONTINUOUS RECORDING OF SMALL AIR IONS IN CLOSED ROOMS. *Arkiv Geofys., 4(29):563-576, 1965. 9 refs.*

Continuous recordings were made of the concentration of small air ions in different closed rooms at the Institute of High Tension Research in Uppsala, Sweden. Radon and its decay products which are naturally produced in the ground and which are capable of escaping into other parts of a building from the basement appeared to the primary source for the high densities recorded in most rooms at the Institute. Generally, the ionic conditions were of different character in different rooms. Time variations on a large scale were also recorded in most of the rooms, and the ion density variations were likewise different for different rooms.

1964

37209 **APTIC NO. 59541**

Fujimura, Yutaka

STUDIES ON THE TOXICITY OF MERCURY (HG SERIES NO. 7) 2ND REPORT: ON THE PRESENT STATUS OF MERCURY CONTAMINATION IN ENVIRONMENT AND FOODSTUFFS. *(Suigin no dokusei no kansuru kenkyu; Dai-2-ho: kankyo oyobi shokuhin no Hg osen) Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), vol. 18:10-19, 1964. 12 refs.*

Concentrations of mercury were measured in Japanese air, water, soil, and foodstuffs in an effort to confirm the present status of Hg contamination in daily life in Japan. Atmospheric concentrations ranged from 1.2-18.0 micrograms/cu m for the urban area and seemed to increase in proportion to the automobile traffic volume. Areas isolated from traffic showed concentrations similar to those of the rural area (1.2-2.4 micrograms/cu m). Mercury concentrations in rivers and ditches in Tokyo were approximately ten times as high (0.004-0.1 ppm) as those for the rural area. A concentration of 0.0006 ppm Hg was found in rain and snow in the urban area. Soil concentrations were 0.018-0.02 ppm for city street dust and 0.36-0.38 ppm for field and rice paddy areas. Polished and unpolished rice, reportedly treated with organic mercurials for protection against rice blast, showed relatively high values ranging from 0.03-0.14 ppm. Especially high values were also found in chicken, egg yolk, and tuna meat.

ATMOSPHERIC INTERACTION

1974

37210 **APTIC NO. 59333**

Ackerman, Bernice

WIND FIELDS OVER THE ST. LOUIS METROPOLITAN AREA. *J. Air Pollution Control Assoc., 24(3):232-236, March 1974. 6 refs.*

The wind fields over the St. Louis metropolitan area on two fair summer afternoons are described. Significant variations in both space and time domains were found in the lowest 2 km. At least some of the perturbations appear to be urban-related. The mean airflow was wavelike in the lower 500 m. Wind speeds varied by 20 to 30% and wind by 20 to 30 deg over the metropolitan area. This velocity field resulted in new convergence .00001 to .00005/sec downwind from the main industrial-commercial complex. Significant changes in wind velocity occurred on fairly short time scales. With suppressed convention, long-period oscillations propagated across the area at 2 to 3 times the speed of the mean wind. With stronger convection, the perturbations were larger and of shorter duration and an exchange of momentum across the subsidence inversion was occasionally indicated. (Author abstract)

37211 **APTIC NO. 59645**

Barnum, D. C. and G. V. Rao

THE INTERACTION OF THE URBAN HEAT ISLAND WITH THE PLANETARY BOUNDARY LAYER. *Preprint, American Meteorological Society, p. 176-179, 1974. 14 refs. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

The role of advection in influencing the temporal and spatial variations of the depth of the mixed layer over an urban-rural complex during the daylight hours is described. A simple advective model was constructed and used to demonstrate the importance of wind shear between the mixed and stable layers. The inversion intensity and sensible heat fluxes into the mixed layer were allowed to vary. Their impact of the depth of the mixed layer was studied. Future research will be conducted to understand the influences of various factors on the mixing depth and to eliminate limitations of the current model.

37212 **APTIC NO. 60122**

Bessemoulin, P. and M. Benarie

STUDY OF THE DIFFUSION OF GASEOUS POLLUTANTS IN THE ATMOSPHERE. *(Contribution a l etude de la diffusion des polluants gazeux dans l atmosphere). Text in French. Atmos. Environ., 8(3):261-279, March 1974. 11 refs.*

The influence of certain parameters on the atmospheric diffusion of gaseous pollutants was studied, and numerical solutions of the differential equations of turbulent diffusion were obtained taking account the gradients of wind speed and diffusivity. The influences of the surface layer, of the rotation of wind direction with height, the growth of the plume due to the turbulence in downwind direction, and the magnitude of the distance from the emission source of an important topographic feature on the turbulent diffusion were investigated. Finally, the numerical simulation was compared with experimental results. The comparison showed excellent agreement between the calculated and observed values, particularly for great distances from the emission source, and seemed to indicate that any remaining differences between the various concentration distributions are due to surface roughness variations.

37213 **APTIC NO. 60028**

Bohac, R. L., W. R. Derrick, and J. B. Sosebee

SENSITIVITY OF THE GAUSSIAN PLUME MODEL. *Atmos. Environ., 8(3):291-293, March 1974. 8 refs.*

In using the Gaussian plume model, a range of values for the vertical dispersion coefficient should be considered in determining maximum possible concentration levels. A method is developed which identifies this maximum and analyzes the sensitivity of the model to small changes in the range of values of the dispersion coefficients. (Author abstract)

37214 **APTIC NO. 60224**

Bringfelt, Bjorn, Thomas Hjorth, and Sture Ring

A NUMERICAL AIR POLLUTION DISPERSION MODEL FOR CENTRAL STOCKHOLM. *Atmos. Environ., 8(2):131-148, Feb. 1974. 15 refs.*

A numerical air pollution dispersion model for central Stockholm is described along with emission and meteorological data for the test period. Sulfur dioxide concentration statistics were calculated mainly for small area sources at positions of four downtown measuring sites. The best agreement between observed and predicted concentrations was found if the stability over the city was always taken as independent of the surrounding rural area and corresponding to an unstable Pasquill-Turner class. Some residual scatter, probably due to measurement and source estimate inaccuracies, was evident; but the agreement was sufficiently good to warrant further study. (Author abstract modified)

37215 **APTIC NO. 59643**

Brown, H. Albert

A COMPARISON OF MESOSCALE PRECIPITATION AND VISIBILITY OBSERVATIONS WITH RADAR ECHOES. *Preprint, American Meteorological Society, p. 214-217, 1974. 4 refs. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

An automated surface weather network which operates in conjunction with weather radar was established for use in short-range forecasting. Network instrumentation includes forward scattering visibility meters which measure atmospheric extinction coefficients, rain gauges, radar, and computers. Precipitation, visibility, and radar data gathered during the summer and early fall of 1973 during periods of convective activity that contained considerable variation in results are discussed. The composite scattergram comparing precipitation and visibility measurements for all cases studied showed closeness of scatter, lack of resolution of precipitation data, and lack of data at very low precipitation rates. The standard error of estimating the 1-minute average visibility from the 1-minute precipitation rates was 20%. The correlation coefficient was .92 and the slope of the line of best fit was .90. Range-normalized radar signals were compared with visibility. This comparison for all data gave a standard error of 35% with a correlation of .83 for estimating the 1-minute extinction coefficient from the radar signals. Radar will be used in forecast operations in the future.

37216 **APTIC NO. 60130**

Chen, T. S.

ON THE LARGE-SCALE HORIZONTAL EXCHANGE COEFFICIENTS. *Arch. Meteorol. Geophys. Bioklimatol., Ser. A (Vienna), 23(1):9-11, 1974. 4 refs.*

Values of the horizontal eddy exchange coefficient (K) for large-scale horizontal exchange coefficients for January, April, July, and October were measured as a function of pressure by an equation given by Panchev. They show that the magnitude of K is in the order of 10 to the 11th power sq cm/sec. During the months of April and October the K values are nearly identical. However, in the upper and middle troposphere the April K-values are slightly larger, but become smaller than the October K-values in the lower stratosphere. The significance of such a reverse trend in K with height implies a stability change from stratosphere to troposphere with a relatively unstable troposphere in April.

37217 **APTIC NO. 59642**

Cormier, Rene V.

THE NATURE AND VARIABILITY OF INTEGRATED BOUNDARY LAYER WINDS. *Preprint, American Meteorological Society, p. 244-249, 1974. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

The nature and variability of vertically integrated boundary layer winds (IBLWs) or implicitly boundary layer momentum were studied. The IBLWs are responsible for the mean transport of pollutants in an urban complex and are essential parameters in air pollution models. The study was concerned with boundary layer winds integrated to a height of 1000 ft; the effect on IBLWs of varying the integration depth from 500 to 1500 ft was also studied. The base of the integrated layer was generally 50 ft, somewhere near the top of the constant-flux layer. The only data suitable for studying the nature and temporal variability of IBLWs for such heights are measurements taken on tall towers. An extensive search was made for such data, and data was obtained for rural locations near Dallas, Las Vegas, Oklahoma City, and Beech Island, South Carolina. A small amount of data in which simultaneous and horizontally separated, double-theodolite pilot balloon wind soundings had been taken was used to study the spatial variability of IBLWs for distances of the order of 0 to 30 miles. The research showed that IBLWs may differ appreciably in magnitude at different locations; have both considerable universality in the nature and variability, and may be regionally dependent; and have a pronounced diurnal variation linked to sunrise/sunset time. Information was determined on general and spatial variability of IBLWs as a function of time of day, stability, and prevailing wind. The IBLWs depend on wind direction, constant-flux layer, and integration depth. The behavior of the IBLWs is strongly related to the average layer temperature minus (or divided by) the layer-top temperature, and the percentage of the layer within which the temperature increases with height. The IBLW represents an effective device for studying boundary layer characteristics at different locations. Differences in IBLWs calculated with and without wind direction considerations, represent a device to study the magnitude of boundary layer wind direction changes with height.

37218 **APTIC NO. 60279**

Gatz, Donald F.

METROMEX: AIR AND RAIN CHEMISTRY ANALYSES. *Bull. Am. Meteorol. Soc., 55(2):92-93, Feb. 1974. 3 refs.*

Causes of inadvertent precipitation modification in the St. Louis area were studied by using tracers to measure particle removal efficiencies and to follow particles ingested in convective storm updrafts and by measuring trace element concentrations in rain and air sampled upwind and downwind of the city to determine where and when urban pollutants appear in downwind precipitation. Tracers were released from various surface locations on 9 days to investigate whether urban aerosols could reach cloud level in time to influence near-downwind precipitation; deposition patterns showed that materials released near the ground were capable of entering convenctive clouds and depositing in rain within short times and distances from the release point. Trace element measurements showed that mean concentrations in both air and rain increased by at least 50% from upwind to downwind of the city. For each element the relative concentration increase in the rain matched or exceeded that in the air, confirming the fact that urban aerosols are quickly incorporated into and deposited by rain.

37219 **APTIC NO. 60272**

Goldberg, Edward D.

THE SUPRISE FACTOR IN MARINE POLLUTION STUDIES. *Mar. Technol. Soc. J., 8(2):29-34, Feb. 1974. 39 refs.*

Marine pollution studies and the atmospheric transport of large organic molecules from continents to oceans are reviewed. Atmospheric transport has been invoked to explain the concentrations of polychlorinated biphenyls in North Atlantic seawaters and marine organisms; the widespread distribution of halogenated hydrocarbons in components of the marine system from the grey whales in the Bering Sea to the penguins of Antarctica can be understood using the concept of atmospheric transport. Dimethyl sulfide has been found in substantial quantities in seawater, though not detected in the atmosphere where it is apparently very unstable. The finding of low molecular weight halogenated hydrocarbons in the atmosphere and seawater, many of which have their origin in man-made activities, provokes consideration of the possibility of significant reduction in methylation reactions. Such substances, expecially fluorinated species, are active inhibitors of the methyl transfer process. Annual rainfall measurements over the oceans coupled to the average DDT residue content of rains indicate that as much as 25% of the DDT compounds produced to data may have been transferred to the sea.

37220 **APTIC NO. 59789**

Haagenson, Philip L. and Alvin L. Morris

FORECASTING THE BEHAVIOR OF THE ST. LOUIS, MISSOURI, POLLUTANT PLUME. *Preprint, American Meteorological Society, p. 172-175, 1974. 4 refs. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

Forecasts of the position and structure of the St. Louis pollutant plume became necessary during the planning of a project to obtain estimates of the mean lifetimes of a number of pollutants in the range of 1 hr to 2 days. Ground and air measurements were taken at 80 and 120 km from the urban center where both labile and stable contamination originated so that changes in their ratios could be determined. The forecast requirements were to predict, up to 24 hr in advance, when the plume would be in the sampling network and when the flow would be quasi-steady and to predict a few hours in advance precisely where the sampling stations should be located. A horizontal advection plume model and a transport vector plume model were compared, and a horizontal advection model was used to visualize the behavior of the plume in three dimensions. Ways are suggested to apply the models to the problem of forecasting the position and structure of the plume at 80 to 120 km from the city, and some of the results obtained during two field tests in Oct. 1972 and April 1973 are presented. Although the horizontal advection model could be used quantitatively for forecasting the plume position at any level, it was convenient to use a simple transport vector plume model to predict the location of the plume at a level midway between the surface and the top of the polluted stratum. Comparisons between the plume determined from the field measurements and the models show that the models satisfy the objectives for which they are designed.

37221 **APTIC NO. 59613**

Hobbs, P. V., H. Harrison, and E. Robinson

ATMOSPHERIC EFFECTS OF POLLUTANTS. *Science, 183(4128):909-915, March 8, 1974. 18 refs.*

The influence of various air pollutants on the atmosphere is considered, and criteria are proposed for the classification and control of such pollutants. The dispersion cycle of a pollutant through the atmosphere depends on the nature of the source, its dilution and dispersion by atmospheric motion, and the removal or scavenging of the pollutant by atmospheric and surface processes; and the evaluation of a new material as a potential source of air pollution must taken into account the material at the various stages in its manufacture and disposal. Aerosols appear to be the principal agents by which pollutants affect weather and climate, and they are most likely to act by influencing the structure and distribution of clouds. They may also influence the vertical temperature structure of the atmosphere which in turn influences mixing and dispersion and the buildup of aerosols. Inadvertent modification of the microstructure and distribution of clouds will not only affect precipitation processes but also radiative properties. Water vapor, carbon dioxide, and ozone each significantly affect the heat transfer of outgoing thermal radiation from the earth's surface. Molecules which are likely to interact strongly with photochemical oxidation sequences in the air are: photoactive molecules which may form atomic oxygen, hydroxyl radical, atomic hydrogen, or halogen atoms in ultraviolet or visible radiation; free-radical scavenging molecules; olefinic molecules, especially those with conjugated double bonds; molecules with aromatic and heterocyclic rings; molecules that form long-lived triplet states by absorption near 3000-4000 A; and molecules with strained rings.

37222 **APTIC NO. 59767**

Holzworth, George C.

METEOROLOGICAL EPISODES OF SLOWEST DILUTION IN CONTIGUOUS UNITED STATES (FINAL REPORT). *National Environmental Research Center, Research Triangle Park, N. C., Meteorology Lab., Program Element 1AA009, Environmental Protection Agency-650/4-74- 002, 400942FDD1, 86p., Feb. 1974. 3 refs.*

NTIS: PB 229588/AS

Five years of mixing height and wind speed data were analyzed to determine the episodes of slowest dilution lasting 1, 2, 3, 4, and 5 days at each of 62 weather stations in the contiguous United States. Dates and meteorological data are given for each episode, the stations are ranked by their values on a slowest dilution parameter, the monthly variation of episodes is summarized. Maps are presented showing isopleths of slowest dilution values. The data is applicable in modeling and appraising atmospheric transport and diffusion during episodes of extremely low dilution. (Author abstract modified)

37223 **APTIC NO. 60307**

Husar, R. B., D. L. Blumenthal, J. Anderson, and William E. Wilson

THE URBAN PLUME OF ST. LOUIS. *Preprint, American Chemical Society, Washington, D. C., 8p., 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry, Meeting, Los Angeles, Calif., March 28-April 5, 1974.)*

The three-dimensional structure of the urban plume for the city of St. Louis was mapped by an instrumented single engine aircraft which continuously measured the aerosol light scattering coefficient, total nuclei concentration, carbon monoxide, sulfur dioxide, ozone, temperature, humidity, and turbulence intensity. The urban plume, measured at 35 and 50 km downstream from downtown and under steady northeast 3 m/sec wind conditions, was found to be almost gaussian with sigma equal to 10 km and confined to a mixing depth of 1000 m. Simultaneous pilot balloon soundings provided the vertical wind velocity profiles which gave a plume air flow of 2.5 times 10 to the 11 cu m/hr. The horizontal optical depth of aerosol plume added by the metropolitan area to the background was found to be equal to 2.5 while the average vertical depth was equal to 0.2. An aerosol mass flow of at least 7.5 times 10 to the 3 kg/hr was estimated; similar estimates were made for the flux of SO2, CO and heat. Strong evidence under stagnant wind conditions at night was found for the existence of an urban heat island-induced vertical air flow, rising over the downtown area. The urban plume in this case was directed vertically and spread radially underneath an elevated inversion layer. (Author abstract modified)

37224 **APTIC NO. 59958**

Ito, Kyoji

AIR POLLUTION AND WEATHER. *(Taiki osen to kisho ni tsuite). Text in Japanese. Gijutsu to Kogai (Tech. Pollut.), 4(2):892-896, March 1974.*

The effects of inversions, winds, and seasons on air pollutant concentrations are discussed. Temperature and topographic interactions also affect pollutants. Nitrogen oxides, sulfur oxides, and particulates should be monitored in relation to these atmospheric factors.

37225 **APTIC NO. 59602**

Koljkovski, P.

STUDY OF THE PATHS OF CHEMICAL POLLUTANTS INTO THE ENVIRONMENT. *(Zur Frage der Wanderung von chemischen Schadstoffen in die Umwelt). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(3):163-166, 1974. 6 refs.*

Facts such as the increase of the lead concentration in the Artic or the increase of air pollution in Hawaii over the past decade by 30% show that chemical pollutants have exceeded critical concentrations and have entered the cycle of nature. A model mechanism which explains the entry of such pollutants into the natural cycle is presented. The pollutants are produced and discharged in the noosphere where they enter the first sub system, the geosphere, soil, air, and water. They travel then according to two cycles, the primary cycle in the geosphere and the secondary cycle in the biosphere. They travel in two basic forms, the chemical, characteristic for the primary cycle in the geosphere and the biochemical form, characteristic for the secondary cycle. The plants form the connecting link or the barrier between the geospheric and biospheric cycle. In the noosphere, both forms are present. The chemical form is mainly found in the raw materials of inorganic origin used for production, the biochemical form primarily in food and in raw material of organic origin. The probable travelling mechanism in the environment of an air pollutant X and of DDT according to the described model is discussed.

37226 **APTIC NO. 60242**

Kondo, Jiro

STUDIES ON AIR POLLUTION DUE TO AUTOMOTIVE ENGINES. *Bull. JSME (Japan. Soc. Mech. Engrs.), 17(103):115-124, Jan. 1974. 15 refs.*

Mathematical modeling of turbulent diffusion is described. Pollutants are transported by the air stream and diffused by eddy flow. The turbulent diffusion equation describing these phenomena is common to the case of diffusion of automobile exhaust and the case of smoke diffusion from stacks. The Gaussian plume model is available for the case of primary pollution where no chemical reaction is included. The model is easily applied when the parameters of the model can be determined by the meteorological conditions. However, the diffusion equation should be solved numerically if the air flow is not uniform or the secondary pollution is included. In this case, adequate estimation of diffusion coefficients is rather difficult. The characteristics of air pollution caused by automobiles are compared with those of smoke from stacks. The concentration of carbon monoxide in a street canyon at various instants of the traffic signals cycle is described. The three-dimensional solutions of the diffusion equation in a region of a busy cross section of roads are compared with a field survey. The CO concentration in San Jose is determined theoretically and compared with field results. The method of analysis of secondary pollution including the formation of photochemical smog is discussed. Diurnal variation as well as the isopleths of pollutants in Tokyo are worked out. (Author abstract modified)

37227 **APTIC NO. 60295**

Longhetto, A., D. Anfossi, G. Fiorito, and P. Pavese

ASSYMETRIES IN THE HORIZONTAL EULERIAN VELOCITY FLUCTUATIONS OF THE WIND. *Atmos. Environ., 8(3):253-259, March 1974. 4 refs.*

Some Eulerian measurements of wind speed and direction and their fluctuations are analyzed. Horizontal anisotropy and the presence of horizontal fluxes of momentum are demonstrated. The theoretical work was verified by field studies of wind speed and direction on top of the meteorological tower of the Trino Vercellese Environmental Laboratory in Torino, Italy. Experimental results of 20 different runs are summarized. At this site, the horizontal fluxes of momentum were due to irregularities in the local terrain, rather than to the shear of speed and/or direction with height. If the results of this sort of analysis on the horizontal Eulerian wind velocity are to be used in diffusion studies, they should be compared with measurements of the spread of a tracer released in the atmosphere.

37228 **APTIC NO. 60147**

Luetzke, Klaus

THE DISPERSION OF LIQUID GAS IN OPEN AIR DURING DISCHARGE IN LIQUID PHASE - A COMPARISON WITH METEOROLOGICAL PARAMETERS. *(Die Ausbreitung von Fluessiggas im Freien beim Ausstroemen aus der Fluessigphase - ein Vergleich mit meteorologischen Parametern). Text in German. Staub, Reinhaltung Luft, 34(2):41-47, Feb. 1974. 20 refs.*

The flow of liquefied gas escaping during discharge from the liquid phase in the direction of the wind is described. Test results for the maximum ignition range as a function of the amount of outflowing gas and wind velocity are reported and discussed. The results are compared with values obtained from meteorological propagation calculations. Under specific test conditions and without correction these calculations give ignition ranges that are too short for distances less than 20 m because the product of the standard deviations measured during the tests with liquefied gas is smaller than when meteorological data are used. For correction, a displacement of the source point in the direction of the wind with simultaneous consideration of the outflow and evaporation process is proposed. Questions concerning the illustration of outflow, evaporation, and propagation by means of a model are discussed, along with problems of the safety zone and protective emission range.

37229 **APTIC NO. 59625**

Lyons, Walter A., Jerome A. Schuh, and Henry Y. Shaheen

NUMERICAL MODELING OF MESOSCALE SUSPENDED PARTICULATE AND SULFUR OXIDE PATTERNS IN AN URBAN GREAT LAKES SHORELINE ENVIRONMENT. *Preprint, American Meteorological Society, p. 198-201, 1974. 8 refs. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

During the spring and early summer, serious air pollution problems exist with about 50 km of the Great Lakes shoreline. Plume fumigation and trapping zones occur along the shore which increase sulfur dioxide concentrations. The Great Lakes UWM Mesometeorology Project Model was developed to determine region-wide short-term air quality levels if the effluents for all sources were computed and combined. A regional emission inventory, a set of algorithms and equations, an efficient computation scheme, and data for validation of the computations were compiled. The model predicts air quality levels based on total suspended particulates, particle concentrations, sulfur oxides, and meteorological and navigational parameters. The model is the first to provide mesoscale calculations of the plume trapping and fumigation episodes occurring on the Great Lakes coastline.

37230 **APTIC NO. 59663**

Martin, Donald E.

SOME AIR POLLUTION CLIMATOLOGIES OF THE ST. LOUIS URBAN COMPLEX. *Preprint, American Meteorological Society, p. 180-182, 1974. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

Data processing studies of St. Louis climatological data are described. The data was used to identify meteorological parameters and their respective scales which must be considered by numerical modeling during air pollution research. Twice daily radiosonde data, taken on weekdays at the Arch from 1970 to 1972, and air pollution measurements for carbon monoxide, sulfur dioxide, winds, and temperatures for a number of St. Louis locations were utilized. The CO concentrations varied significantly between weekdays and weekends. Therefore, attempts to model the concentrations of this substance over St. Louis must consider the effects of variable traffic patterns. It was necessary to normalize the statistics for each month in formulating the 3-year data base to be used in processing correlations between CO and SO2 concentrations at each of the sites. Diurnal variations in mixing depth, transport wind, and ventilation were determined. Air pollution concentrations correlated with transport wind speeds and directions. The air pollution was highest when a veering wind with height acted to stabilize the lower boundary layer through differential advective processes. Numerical modeling efforts must consider variable wind speeds and directions over short-time intervals in the advective terms.

37231 **APTIC NO. 59363**

Mueller, U.

THE CALCULATORY ESTIMATION OF ATMOSPHERIC DISPERSION OF GASEOUS AIR COMPONENTS FROM CONTINUOUS POINT SOURCES CLOSE TO THE GROUND LEVEL. *(Zur rechnerischen Abschaetzung der atmosphaerischen Ausbreitung von gas foermigen Luftbeimengungen aus bodennahen kontinuierlichen Punktquellen). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(2):85-87, 1974. 13 refs.*

The familiar dispersion models by Turner, Smith, Sutton, and Peklo for high level sources were used for determining the concentration distribution on the leeward side, below the smoke plume axis, of ground level point sources of air pollutants. For better comparison of the concentrations calculated with the various formulae, a uniform sampling time of 30 min was used. The results are presented in a form which shows the dependence of the ratio concentration times wind speed to source strength on the distance from the source. A comparison of these results with experimental measurements yielded satisfactory agreement.

37232 **APTIC NO. 59662**

Muench, H. Stuart

ACCURACY OF THE FORWARD SCATTER VISIBILITY METER. *Preprint, American Meteorological Society, p. 210-213, 1974. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

Real-time forecast experiments were conducted using a fine-scale network of automatic weather stations to improve short-range forecasts of visibility for aircraft operations. A small instrument was needed which would be reliable, stable, and sensitive over at least two orders of magnitude in visibility, 50 m to 5 km. Such an instrument was developed which measures forward light scattering to replace the transmissometer. Calibration was determined using a 152 m transmissometer and converting the output to extinction coefficient to compare with the output of the forward scatter instrument. General purpose radar and cloud detection radar were key components of the mesoscale observing system. Data units were installed at each remote station to transmit data to the computer six times/min. The data acquisition system and meteorological sensors performed very well. High correlation coefficients between the forward scatter visibility meter and the transmissometer verified the confidence that the forecasters acquired in the instruments. When the forward scattering visibility meter was compared to visual observations, differences were found. These could have been due to the fact that the observer was usually 5 to 10 min behind actual changes and was often out of phase, while the forward scattering meter showed correct results, when rapid changes were occurring and observers were sending out several observations every hour.

37233 **APTIC NO. 60131**

Nakano, Michio

ESTIMATION OF CONTRIBUTION EXTENT OF POLLUTION SOURCES TO AIR POLLUTION AND ITS APPLICATION. PART 1. ATMOSPHERIC DIFFUSION. *(Taiki osen kiyoritsu no suitei to sono oyo (1) Taiki kakusan). Text in Japanese. 0Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 48(1):15-22, Jan. 1974. 5 refs.*

Control of sulfur oxides has been planned for the west seashore industrial district of Osaka city, and pollution sources which contribute to the build up of sulfur oxides have been quantitatively estimated. The technique employed simulation of atmospheric diffusion, and its usefulness has been confirmed. The contribution of each pollution source to sulfur oxide pollution in the surrounding areas were estimated. Based on this study, each pollution source was requested to reduce their air pollution contribution. As a result, in 1972 sulfur oxide concentrations of the west seashore industrial district were successfully reduced to the concentration level initially envisaged. The estimation of atmospheric diffusion of sulfur oxides which was used to estimate the air pollution contribution of the pollution source is described. The atmospheric dispersion of stack effluents, the effect of wind direction and velocity, the estimation of effective stack height, the diffusion equations, and the diffusion parameters are mentioned.

37234 **APTIC NO. 60243**

Olsson, L. E., M. P. McCormick, W. P. Elliott, and S. H. Melfi

AN OBSERVATIONAL STUDY OF THE MIXING LAYER IN WESTERN OREGON. *Atmos. Environ., 8(3):241-252, March 1974. 6 refs.*

Intensive observational studies of the natural ventilation of the Columbia-Willamette Valley region were conducted during the summer of 1970. During a 7-day period, lidar measurements of the haze layer were coordinated with rawinsonde, aircraft, wind, and pilot balloon measurements. These observations were made over Salem, Oregon. Temperature and aerosol concentration profiles were obtained from an instrumented light aircraft. The results agreed well with the estimates of pollutant distribution from the lidar and from direct measurements of particle concentration made from an aircraft. The top of the mixing layer, as defined by these measurements, was generally within a stable layer aloft. There was little vertical separation by particle size within the aerosol. There was good agreement between water vapor profiles measured by lidar and radiosonde. Lidar potential for mesoscale observations of pollution as well as monitoring time changes in the height of the aerosol layer were established. Particle concentrations generally decreased rapidly with height over a depth of 100-400 m. This height did not always coincide with the inversion base. The base of the inversion did not appear to be a lid, but rather was the height at which the aerosol concentration begins to diminish rapidly. Although particle concentration decreased below the base of the inversion in a few cases, the decrease usually began above the base. Thus, the height of the inversion base was likely to give an underestimate of the volume of air affected by a pollutant. (Author abstract modified)

37235 **APTIC NO. 59785**

Parmenter, Frances C.

OBSERVING AND FORECASTING LOCAL EFFECTS FROM SATELLITE DATA. *Preprint, American Meteorological Society, p. 46-49, 1974. 2 refs. (Presented at the Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974.)*

Continuous satellite data over the U. S. can be used to observe the establishment and dissipation of many small scale cloud formations due to local effects. The distribution of cloudiness to the lee of the Great Lakes, along the East Coast, and over the mountainous states is discussed. During the winter months, cold continental air passes over warm water bodies of the Great Lakes producing numerous cloud lines oriented parallel to the low-level winds. In a north-south flow, these lines usually form over the water and continue downwind over the land; thus producing large areas of dreary, low cloudiness, or narrow concentrated snowstorms on the lee shores. Similar cloud lines are observed along the East Coast after the passage of a cold front. The downwind cloud edge basically conforms to the shape of the exit land mass. Exceptions are the two enhanced cloud lines that form the Delaware and Chesapeake Bays. These lines form due to heating by the upwind cities and advection over the warmer bay waters. The formation and distribution of fair weather cumulus is a function of the amount of solar energy absorbed by different types of surfaces. These cumulus clouds form over the rapidly heated land surfaces and seldom form over cooler bodies of water such as lakes and rivers. Fog and stratus clouds, formed by upslope motion of moist air, are quite prevalent along the eastern slopes of the Rockies. Another orographic effect frequently observed is the generation of cloudiness downwind of the mountain barriers. The data shows a number of mountain-initiated cloud plumes. The satellite data can be used to assess the presence of such local effects and their areal coverage. From that, forecasts of temperature and precipitation or cloudy to clear can be forecasted for the ensuing 6 to 12-hour forecast period.

37236 **APTIC NO. 60271**

Phillips, Fred T.

SOME ASPECTS OF VOLATILISATION OF ORGANOCHLORINE INSECTICIDES. *Chem. Ind. (London), 2(5):193-197, March 2, 1974. 14 refs.*

Losses which involve the direct volatilization of an insecticide from the treated surface into the atmosphere are considered. Very large proportions of organochlorine insecticides are lost by direct volatilization soom after the application of heavy deposits to surfaces; thereafter, losses occur at a diminishing rate and may follow some form of exponential curve, provided these losses are uniform over the treated sufaces. Interaction of the insecticide with the substrate or the influence of other components in its formulatuon may be important, especially at low deposit densities, in delaying or preventing loss by volatilization. Temperature has the greatest effect among environmental factors on the rate of volatilization, followed by wind speed while humidity usually has a very small effect. The use of some type of slow-release mechanisms, such as microencapsulated formulations, is one possible method of overcoming these large initial losses so that smaller amounts of insecticide can be used more efficiently while still maintaining the lethal concentrations required.

37237 **APTIC NO. 60111**

Podzimek, Josef and Adel N. Saad

EVOLUTION OF GIANT CHLORIDE NUCLEI SIZE SPECTRUM ON THE SEASHORE. *Arch. Meteorol. Geophys. Bioklimatol. Ser. A. Vienna, 23(1):77-86, 1974. 21 refs.*

The distribution function of cloud condensation nuclei in a supersaturated maritime atmosphere was deduced. The calculation is based on the Nukyiama-Tanassava distribution function and on the data deduced from the measurement of giant chloride nuclei concentration with a cascade impactor on the seashore. The supersaturation distribution function found was a decreasing function unlike the relationship calculated using Junge s distribution law. (Author abstract)

37238 **APTIC NO. 59482**

Pueschel, Rudolf F., Charles C. Van Valin, and Farn P. Parungo

METEOROLOGICALLY SIGNIFCANT AIR POLLUTANTS. *Preprint, National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Laboratory, 14p., 1974 (?). 11 refs.*

Cloud and ice nuclei measurements were performed in metropolitan Denver with a thermal diffusion cloud chamber and an acoustic ice nucleus counter, while membrane samples taken simultaneously were subjected to scanning electron microscopy and x-ray energy spectrometry in order to correlate the nucleation efficacy of the aerosol to its physical and chemical surface characteristics. The city aerosol was of a mixed nature, caused by an interaction of natural clay particles with anthropogenic aerosols and gases. The atmospheric number concentration of particles containing the elements lead, chlorine, and sulfur were associated with the intensity of human activities and therefore subject to temporal fluctuations. Leadbromochloride, a compound found in gasoline engine exhaust, and sulfur aerosols temporarily increased the surface solubitility and capillarity of naturally produced insoluble clay particles, a phenomenon capable of altering the atmospheric nuclei budget and affecting the removal mechanism of pollutants from the atmosphere.

37239 **APTIC NO. 59325**

Raynor, Gilbert S., Janet V. Hayes, and Eugene C. Ogden

MESOSCALE TRANSPORT AND DISPERSION OF AIRBORNE POLLENS. *J. Appl. Meteorol., 13(1):87-95, Feb. 1974. 15 refs.*

Pollen transport and dispersion from generalized area sources was studied by 29 flights to distances of 100 km and height of 3 km using an aircraft-mounted isokinetic sampler. Tree pollens and ragweed pollen served as tracers. Four types of flights were made to study various aspects of pollen transport: ascents over a fixed location to investigate vertical distribution; flights over a source-free area to document change of concentration with distance; east-west flights along Long-Island to study the influx of pollen from the mainland with westerly winds; and vertical ascents and horizontal flights during sea breeze flows to determine their effect on pollen concentrations. Large quantities of pollen are transported in orderly fashion from their source regions but pollen often travels in large, discrete clouds. Pollen is transported to Long Island from the mainland in some quantity. Sea breeze flows greatly decrease low-level concentrations but pollen is carried aloft at the sea breeze front and recirculated in the return flow aloft. Vertical distribution is reasonably well related to lapse rate although secondary concentration peaks which often occur below elevated inversions cannot be explained by the data obtained. (Author abstract)

37240 **APTIC NO. 59997**

Roessler, Fritz

DUST LAYERS IN THE ATMOSPHERE. *(Staubschichten in der Atmosphaere). Text in German. Umschau Wiss. Tech., 74(3):89-90, 1974. 3 refs.*

The scattering of sunlight was measured as a function of height using rockets and balloons. Aerosol number was obtained by quantitative analysis. Layers containing an increased concentration of aerosols are located at 25 km but they are also found at altitudes of 50 and 75 km. In the case of noctilucent clouds, a sharp-edged layer is observed at 82 km. The particles forming the layer at 25 km were analyzed as ammonium sulfate. Nothing is known about the chemical composition of the particles forming the layers at 50 and 73 km, nor is it known whether these layers are always present. (Author abstract modified)

37241 **APTIC NO. 60274**

Shir, C. C. and L. J. Shieh

A GENERALIZED URBAN AIR POLLUTION MODEL AND ITS APPLICATION TO THE STUDY OF SO2 DISTRIBUTIONS IN THE ST. LOUIS METROPOLITAN AREA. *J. Appl. Meteorol., 13(2):185-204, March 1974. 38 refs.*

A generalized urban air pollution model, based on numerical integration of the concentration equation, was developed for the study of air pollutant distributions over an urban area. The model computes the temporal and three-dimensional spatial concentration distributions resulting from specified multiple point and area sources by using currently available meteorological and source inventory data. A new method based on experiments and a turbulence transport model is used to estimate the turbulent diffusivity and atmospheric stability. Special treatments of the finite-difference scheme to accommodate the large variations of concentrations are discussed. An effort was made to avoid any subjective analysis scheme for the preparation of the input data. The model was used to study sulfur dioxide distributions in the St. Louis metropolitan area during 25 consecutive days in Feb. 1965. The computed results are evaluated with respect to oberved data by using various statistical methods. The computed results agree favorably with experimental measurements for both long-term and short-term average concentrations. Computations also indicate the model s capabilities and flexibilities for dealing with the rapid variations of atmospheric conditions. The advantages and limitations of the model are also discussed. (Author abstract)

37242 **APTIC NO. 59308**

Sitaraman, V. and V. V. Shirvaikar

LAGRANGIAN SIMILARITY THEORY APPLIED TO DIFFUSION IN THE PLANETARY BOUNDARY LAYER. *Boundary-layer Meteorol., 5(4):419-427, Jan. 1974. 14 refs.*

A similarity theory is developed to describe diffusion of a cloud of passive material in a neutral barotrpic steady state boundary layer of the earth s atmosphere. It is suggested that a characteristic length scale U asterisk/f is relevant in the diffusion process when the diffusing cloud mixes well into the depth of the boundary layer. For an atmosphere having an effective upper bound for vertical spread, an expression for the trajectory of the centroid of the diffusing cloud is derived. The theoretically computed vertical spread is compared with experimental data on diffusion of tracer cloud over rough (urban) and smooth terrains. (Author abstract)

37243 **APTIC NO. 60067**

Slinn, W. G. N.

THE REDISTRIBUTION OF A GAS PLUME CAUSED BY REVERSIBLE WASHOUT. *Atmos. Environ., 8(3):233-239, March 1974. 3 refs.*

An analytical study was made of the influence on a gas plume of reversible scavenging by rain. The result predicts that at a large time, a gas plume will be washed down at a rate H prime J sub o, where J sub o is the rainfall rate and H prime is the dimensionless Henry s law constant for the gas. Cases are discussed considering diffusion and without pollution. An example is given of the use of the equation in the case of a sulfur dioxide plume. When applying these results to other gases, caution must be used in using handbook values for H prime. In some cases, e.g., nitrous oxide, tritium compounds, and so on, for which simple solutions of the gases are formed, this is probably acceptable; the result predicts that such plumes fall orders of magnitude more slowly than an SO2 plume. For other gases which are dissolved and subject to reversible hydration and dissociation, such as SO2, carbon dioxide, and ammonia, H prime is strongly dependent on the concentration, and adequate data is not available. The value of H prime for SO2 used in this calculation is for a concentration of about 0.5 ppm. (Author abstract modified)

37244 **APTIC NO. 59317**

Super, Arlin B.

SILVER IODIDE PLUME CHARACTERISTICS OVER THE BRIDGER MOUNTAIN RANGE, MONTANA. *J. Appl. Meteorol., 13(1):62-70, Feb. 1974. 26 refs.*

A modified NCAR acoustical ice nucleus counter was used in an airborne mode to measure the characteristics of silver iodide plumes released in mountainous terrain. These measurements were a supplement to a winter randomized cloud seeding experiment conducted in the Bridger Range, Mont. The AgI was generally transported upslope from the seeding sites, over the Main Ridge of the Bridger Range some 1400 ft higher, and toward the intended target area. Plume widths averaged 28 deg above the Main Ridge, while most of the seeding agent was confined to the lowest 1500 ft above the ridgeline. Ice nuclei concentrations were typically in the range of 100-1000/l, effective at -20 C. This corresponds to about 10-100 nuclei/l at the warmer temperatures prevalent in the lowest 1500 ft above the Main Ridge during winter storms. The flux of ice nuclei was estimated on three occasions. Agreement was good, both from day to day and with the generator output as calibrated in a large isothermal cloud chamber. (Author abstract)

37245 **APTIC NO. 60246**

Varfalvy, L. and Z. Jegier

FORMATION OF PHOTOCHEMICAL OXIDANTS IN THE URBAN AIR OF MONTREAL. *(Formation photochimique d oxydants dans l atmosphere urbaine de Montreal). Text in French. Chemosphere, 3(1):35-40, Feb. 1974. 17 refs.*

In a study of the possibility of photochemical smog formation in Montreal, the total oxidant, nitrogen dioxide, nitric oxide, and sulfur dioxide concentrations in the air were measured in air samples taken at three different sampling sites; downtown with heavy traffic, one industrial, and one residential district. The 40 minimum-maximum concentrations of the total oxidants, NO2, NO, and SO2 were in the respective ranges of 93-94.9 ppb, 81.8-174.5 ppb, 75.3-138.2 ppb, and 63.5-122.8 ppb. The oxidant and NO levels were in the same order of magnitude in the residential and industrial districts, while the SO2 concentrations were highest in the industrial area. The downtown featured the highest nitrogen oxides concentrations, and the lowest oxidant concentrations. The oxidant concentrations were highest during periods of intense solar radiation and high temperature. The detection of oxidant concentrations around 100 ppb in the air in Montreal indicated that photochemical smog formation was possible under any climate as soon as the meteorological conditions favorable for such a process and the anthropogenic photochemical precursors are present.

37246 **APTIC NO. 60116**

Voloshchuk, V. M. and T. A. Muydinova

THE WASHING-OUT OF FINE AEROSOL PARTICLES FROM THE ATMOSPHERE. *(Vymyvaniye melkikh aerozol nykh chastits iz atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 10(1):44-45, 1974. 12 refs.*

Theoretical analysis of the wet wash-out of fine aerosol particles with radii from 0.001 to 10 micron by cloud particles and rain droplets due to Brownian motion, inertial deposition at intermediate Reynolds numbers, and gravity is presented. The capture coefficient due to pure Brownian diffusion for particles with radii from 0.001 to 0.1 micron was highest inside clouds. An analysis of the capture coefficient under the simultaneous action of catching and gravity, revealed a minimum of the washout effect in the radii range of 0.1-1 micron, peaking at 0.5 micron. For radii up to 10 micron, and under the condition of purely inertial deposition, the efficiency of wet washout was just as high as that determined for pure Brownian diffusion.

37247 **APTIC NO. 60185**

Whaley, H.

THE DERIVATION OF PLUME DISPERSION PARAMETERS FROM MEASURED THREE- DIMENSIONAL DATA. *Atmos. Environ., 8(3):281-290, March 1974. 11 refs.*

The method of finite differences is used to determine the plume axis and the standard deviation of plume spread from three dimensional data acquired by aerial probing. Comparisons are also made with corresponding values estimated by accepted empirical methods. The derivation of reliable values for critical plume dispersion parameters, that are applicable to a given geographic region, significantly improves the precision of computations for specifying stack heights, selecting plant sites, and predicting ground-level pollutant concentrations. Thus, plume dispersion parameters can accurately be determined from sulfur dioxide distributions within the plume by using the method of finite differences. The numerically derived values of coordinates of the center of pollutant mass flow in the cross-wind and vertical dimensions and of the standard deviations of plume spread in the cross-wind and vertical directions effectively eliminate errors caused by subjective and arbitrary interpretation of measured data. The derivation of reliable values for critical plume dispersion parameters will increase the available information on plume dispersion under specific conditions. In addition, by providing factual input data for dispersion models, a significant improvement in the precision of computations for selecting stack heights and predicting ground level concentrations can be expected. (Author abstract modified)

37248 **APTIC NO. 59347**

Whelpdale, D. M. and R. W. Shaw

THE MODERATE- AND LONG-RANGE TRANSPORT OF AIR POLLUTANTS AND THEIR REMOVAL FROM THE ATMOSPHERE. *Experientia Suppl., no. 20: 31-41, 1974. 17 refs.*

Moderate and long range transport of air pollutants and the removal of these pollutants from the atmosphere are examined within the context of the cycling of contaminants through the ecosphere. Evidence exists for the transport of sulfur dioxide over Lake Ontario for distances up to 100 km, and studies of SO2 concentrations and vertical gradients of temperature with respect to regional wind direction show that the mean daily concentration of SO2 increases from 1.8 pphmy (when the regional wind is from the lake) to 3.0 pphmy (when it is from the land). The importance of vertical distribution of temperature for transport of pollutants over large distance is indicated. Measurements of SO2 gradients over Lake Ontario are currently being made to allow for an estimate of turbulent fluxes and thus pollutant exchanges at the interface. Once fluxes have been measured under a variety of atmospheric and surface conditions, then the exchanges of pollutants at the interface will be able to be parameterized on a regional basis, making possible reliable estimates of pollutant sink strengths.

37249 **APTIC NO. 60216**

Wirtz, R. A. and C. M. Chiu

LAMINAR THERMAL PLUME RISE IN A THERMALLY STRATIFIED ENVIRONMENT. *Intern. J. Heat Mass Transfer, 17(2):323-329, 1974. 5 refs.*

The problem of a heated laminar plume rising in a quiescent fluid with stable thermal stratification was investigated; and equations valid for a Prandtl number of less than or equal to 1 which describe the behavior of the centerline plume velocity, temperature excess, and plume radius were developed based on an approximate entrainment rate theory for narrow laminar flows originally proposed by Morton. The theory assumed that profiles of mean vertical velocity and excess temperature were Gaussian distributions at all heights and that the entrainment coefficient, the ratio of radial inflow velocity to mean centerline velocity, was constant. Experiments were performed with plumes generated by small disk heaters using air as the stratified fluid, and the terminal height of rise of these plumes was measured for various thermal stratifications and heat release rates. A method was devised whereby the results for actual, finite-sized heat sources could be related to the theoretical results for point sources, and the experimental results were then used to determine the value of the exntrainment coefficient which was found to be nearly 1. (Author abstract modified)

1973

37250 **APTIC NO. 59225**

Bergstrom, R. W. Jr. and R. Viskanta

SPHERICAL HARMONICS APPROXIMATION FOR RADIATIVE TRANSFER IN POLLUTED ATMOSPHERES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 9p., 1973. 16 refs. (Presented at the American Institute of Aeronautics and Astronautics, Thermophysics Conference, 8th, Palm Springs, Calif., July 16-18, 1973, Paper 73-749.)*

A closed form analytical solution of the spherical harmonics approximation to the equation of radiative transfer is obtained for a nonhomogeneous, plane-parallel atmosphere up to the PN-approximation (a finite series of Legendre polynomials with N plus 1 terms). Gaseous and particulate constituents in the atmosphere are considered to emit, absorb, and anisotropically scatter radiant energy. The P1-P3 approximations of the of the spherical harmonics method are then compared to the 20th order Gaussian quadrature discrete ordinate and iterative methods of solution of the radiative transfer equation for an anisotropically scattering and absorbing medium. The computations performed for both homogeneous and nonhomogeneous atmospheres show that the lowest order spherical harmonics approximations predict the solar fluxes and flux divergences with good accuracy and result in a substantial saving of computational effort as compared to the discrete ordinate and iterative methods. The radiative transfer predictions can be combined into a large numerical model for global circulation, climatic, or thermal structure with the use of this approximation. (Author abstract modified)

37251 **APTIC NO. 59521**

Busse, Adrian D. and John R. Zimmerman

USER S GUIDE FOR THE CLIMATOLOGICAL DISPERSION MODEL. *Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, Program Element 1A1009, EPA-R4-73-024, 144p., Dec. 1973. 15 refs.*

NTIS: PB 227346/AS

A Climatological Dispersion Model (CDM) was developed which determines long-term (seasonal or annual) quasi-stable pollutant concentrations at any ground-level receptor using average emission rates from point and area sources and a joint frequency distribution of wind direction, wind speed, and stability for the samy period. This model differs from the Air Quality Display Model (AQDM) primarily in the way in which concentrations are determined from area sources and in the use in the CDM of Brigg s plume rise formula and an assumed power law increase in wind speed with height that depends on stability. The material presented is directed toward the engineer familiar with computer techniques and will enable him to perform calculations with the CDM. Technical details of the computer programming are discussed; complete descriptions on input, output, and a test case are given. Flow diagrams and a source program listing are included. Details of the model and validation are included. (Author abstract modified)

37252 **APTIC NO. 59899**

Chameides, William and James C. G. Walker

A PHOTOCHEMICAL THEORY OF TROPOSPHERIC OZONE. *J. Geophys. Res., 78(36):8751-8760, Dec. 20, 1973. 42 refs.*

The photochemical theory for tropospheric ozone is presented in which the methane oxidation chain constitutes a large local source. This source produces about 10 to the 12th power odd oxygen molecules/sq cm/sec and implies a photochemical lifetime for ozone of about 1 day, much shorter than characteristic mixing times. The photochemical model reproduces the altitude and seasonal dependence of ozone to 30 deg N. It also gives qualitative agreement with observed day-to-day variations of the ozone density. The various reactions and rate coefficients, average photodissociation frequencies at 30 deg N, the air mass effect, and meteorological data are described. (Author abstract modified)

37253 **APTIC NO. 60011**

Eschelbach, Guenter

COMPUTATIONS OF THE INFLUENCE OF AEROSOLS ON THE ATMOSPHERIC RADIATION BALANCE IN THE VISIBLE SPECTRUM. *Beitr. Physik Atmosphaere, 46(4):249-261, 1973. 29 refs.*

The solar radiant fluxes and their divergence in an aerosol atmosphere are computed from a numerical solution of radiative transfer including polarization effects. The influence of the complex refractive index of the particles and the surface albedo on the radiation balance of the atmosphere in the visible spectrum is predicted. Solar heating rates due to the influence of the aerosol are significant and should not be neglected. A simplified version of the equation of transfer which is applicable for numerical models and the accuracy requirements of measurements to determine the divergence in the atmosphere are discussed. (Author abstract)

37254 **APTIC NO. 59788**

Flemming, Guenther and Herbert Lux

EMISSION SURVEYS AND THEIR USE IN SPACE MANAGEMENT. *(Die Immissionskartierung und ihre landeskulturelle Anwendung). Text in German. Wiss. Z. Tech. Univ. Dresden, 22(4):674-676, 1973. 7 refs. (Conference on Socialist Environmental Patterns in Dresden (Tech. Univ.) 22-24 Nov. 1972.)*

The use of computational emission surveys, as prepared for the territory of East Germany with respect to the sulfur dioxide concentrations, is described. The SO2 concentration survey was prepared on the basis of Sutton s long-term model, with respect to the frequency distributions of wind speeds and wind direction in all 16 directions. The two basic tasks that can be solved by means of concentration surveys are the determination of the necessary stack heights as a function of the emissions and of the maximum allowable ground-level concentrations, and the mapping of pollutant concentrations as a function of emissions and stack heights for the determination of the distribution in space of damages to plants, animals, and man. The concentration survey is also suitable for forecasting purposes with respect to the siting of new emission sources. The SO2 concentration survey demonstrated two major concentration fields in the Halle-Leipzig and Cottbus areas. For the latter, a special forecast indicates an increase in the SO2 concentrations in the near future. A close relationship between the long-term SO2 concentrations and the extension of forest damages was established. The use of high stacks, siting new emission sources in areas with prevailing high speed winds and powerful turbulence, and the use of low-sulfur fuel during unfavorable meteorological conditions, such as during inversion periods, are the basic possibilities of abating SO2 concentrations.

37255 **APTIC NO. 60158**

Fukuoka, S., Toshio Odaira, Hideo Oguri, Yoshio Saiki, Sadao Omichi, Zenichi Kawase, and Haruo Naito

DISCUSSION OF PHOTOCHEMICAL SMOG IN BROAD AREA. *(Kokagaku sumoggu koiki osen keiko no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):560, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 283.)*

Photochemical smog formation in the large area covering Tokyo, Saitama, Chiba, and Kanagawa prefectures were analyzed from the data of 47 days of warning in 1972. Smog formation is prevalent in the summer, but the time of warnings seems to be becoming earlier in the season, now starting in April instead of June. Generally, high oxidant (0.15 ppm) concentrations tend to appear deeper inland. Of the 47 days, simultaneous warnings for these areas occurred on 7 days. The number of locations with simultaneous high concentrations and frequencies were: 1-5 locations, 24 days; 6-10 locations, 12 days; 11-15 locations, 8 days; 16-20 locations, 2 days; and more than 21 locations, 2 days. When all the inversion layer conditions are present, relatively strong sea breezes will not disperse oxidants. High oxidant concentrations can occur in sea breezes or land breezes, but generally the tide areas are the most vulnerable, and stagnation of sea breeze front creates a long sustaining high concentration of oxidants. The peak formation is affected by the movement of the sea breeze front, and when the encroachment of the front is late, the formation of the oxidant peak is late in the day. Generally, the atmospheric stability seems to affect the wide area oxidant concentration, and the sea and land breezes affect local oxidant concentrations.

37256 **APTIC NO. 59408**

Garratt, J. R. and G. I. Pearman

CO2 CONCENTRATION IN THE ATMOSPHERIC BOUNDARY-LAYER OVER SOUTH- EAST AUSTRALIA. *Atmos. Environ., 7(12):1257-1266, 1973. 13 refs.*

Observations of atmospheric carbon dioxide at two sites in Southeast Australia made over a period of several months, together with data from two aircraft flights made in the lowest 3 km of the troposphere are described. The data indicate day-to-day variations in CO2 content (midday values) at any one site are no more than 2-3% of the atmospheric value (5-10 ppm) and are related to changes in the air trajectory. Seasonal variations of similar magnitude are indicated, and depend upon the geographical location of the site, decreasing to near-zero as the coast is approached. The space and time variations of the near surface CO2 content are consistent with the land surface of the southeast part of the Australian continent acting as a net surface sink, at least over the observation periods (winter and spring). Little variation with height was observed in the CO2 content in air of oceanic origin, whereas air of continental origin showed considerable variations of CO2 with height over the first 2 km, related to surface effects. A simple boundary layer model utilizing the two-dimensional diffusion equation can be used to predict changes in the vertical CO2 profile due to surface flux variations. (Author abstract)

37257 **APTIC NO. 60299**

Hanna, Steven R. and Steven G. Perry

METEOROLOGICAL EFFECTS OF THE COOLING TOWERS AT THE OAK RIDGE GASEOUS DIFFUSION PLANT. PART 1: DESCRIPTION OF SOURCE PARAMETERS AND ANALYSIS OF PLUME PHOTOGRAPHS AND HYGROTHERMOGRAPH RECORDS. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., ATDL Rept. 86, 41p., Dec. 1973. 9 refs.*

Source parameters, downwash criteria, visible plume dimensions, and water deposition rate were examined for cooling towers at the Oak Ridge Gaseous Diffusion Plant. An average updraft sp[illegible] 9 m/sec did not vary appreciably from one cell to th[illegible] nd sensible heat flux from each cell was about 2 [illegible] mass median drop size was 1000 micron. Downwash [illegible] d about 30% of the daytime during the summer an[illegible] 50-60% of the daytime during the rest of the year wh[illegible] the stronger winds prevailed. Its occurrence was likely at wind speeds greater than about 3 or 4 m/sec. Cooling tower plumes initiated cloud development about 10% of the time, and typical final plume rise was about 100-200 m. Liquid water deposition rates on the tower walkway and on the ground within 30 m of the tower were in the range of .2-30 micrograms/sq cm sec and averaged about 7 micrograms/sq cm sec. (Author summary modified)

37258 **APTIC NO. 59762**

Hecht, T. A.

URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY. VOLUME I - DEVELOPMENT AND EVALUATION. APPENDIX B - GENERALIZED MECHANISM FOR DESCRIBING ATMOSPHERIC PHOTOCHEMICAL REACTIONS. *Systems Applications, Inc., Beverly Hills, Calif., Environmental Protection Agency Contract 68-02-0339, Program Element 1A1009, EPA-R4-73-030c, 86p., July 1973. 19 refs.*

Validation of an existing kinetic mechanism for a simulation model of ground level concentrations of photochemical pollutants has been conducted and modified for a variety of reactive systems, including single hydrocarbons, binary mixtures, and automotive exhausts. Validation results are extended for to[illegible] nitrogen oxides, toluene-n-butane-NOx, propylene-ethane- NOx, and automobile exhaust. Validation of the mechanism is considered in relation rate constants, generalized stoichiometric coefficients, and sensitivity of the model to variations in the magnitudes of parameters. Sources and estimates of experimental error are also provided. The validation results indicate that the mechanism provides an adequate description of smog chamber kinetics, and the model appears capable of predicting the concentration/time behavior of a variety of reactant systems over a range of initial conditions. Automobile exhaust simulations performed indicate that the mechanism displays promise for describing the complex mixtures that exist in the atmosphere, and guidelines established for estimating rate constants and stoichiometric coefficients are also quite adequate.

37259 **APTIC NO. 60144**

Herbert, F.

IRREVERSIBLE PROCESSES IN THE ATMOSPHERE - PART II. *(Irreversible Prozesse der Atmosphaere - 2. Teil). Text in German. Beitr. Physik Atmosphaere, 46(4):262-288, 1973. 7 refs.*

Several irreversible atmospheric processes are discussed in relation to the so-called simple as well as the overlapping type. These are based on the phenomenological equations of molecular atmospheric systems which result axiomatically from the second law of thermodynamics. There the phenomenological coefficients or their variants such as the coefficients of diffusion, pressure or thermodiffusion, heat conduction, and viscosity are given as functions of variables of state p, T, rho, and m to the k power. With suitable system conditions the coefficients of interference can also be determined from the corresponding simple coefficients. In the case of droplet diffusion it is possible to set up a prognostic differential equation for diffusion velocities, which contains the gradient of chemical affinity as a real external force. The undetermined phenomenological coefficient L22 is expressible as the mobility of droplets. Under the assumption of ideal mixing of the gas phase and droplets one obtains the diffusion coefficient of Einstein-Smoluchowski.

37260 **APTIC NO. 59954**

Hiraoka, M., Y. Ikeda, Y. Okabe, and M. Sasakura

ADAPTATION OF CONVECTION AND DISPERSION IN WATER TO AIR POLLUTION PHENOMENA. *(Suiryu jikken ni yoru tairyu kakusan no taiki osen gensho e no tekiyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):386, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 125.)*

The experimental condition was confined in a state where forced convection of flow exists and an unstable layer is formed within the limit in which the boundary layer equation holds. Skim milk was dissolved in water and the specific gravity of the fluid was adjusted with methanol. The flow speed, temperature, and concentration were measured at the center of the flow about 10 cm from the bottom of tank. The dispersion coefficient was determined from the concentration profiles at two adjacent downstream distances. The concentration distribution calculated from the dispersion coefficient using Pasquill s equation was compared to the observed value and found satisfactory consistent.

37261 **APTIC NO. 60343**

Hosker, R. P., Jr.

ESTIMATES OF DRY DEPOSITION AND PLUME DEPOSITION OVER FORESTS AND GRASSLAND. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. IAEA-SM-181/19, ATDL File No. 85, 28p., 1973. 44 refs. (Presented at the IAEA Symposium on the Physical Behavior of Radioactive Contaminants in the Atmosphere, Vienna (Austria), Nov. 12-16, 1973.)*

A standard plume diffusion model, corrected for dry deposition and consequent plume depletion, was applied to hypothetical sources located at several heights above homogeneous stretches of grassland and forest. The plume was assumed to be composed of material for which gravitational settling was negligible, and estimates were made to account for the probable effects of the forest on above canopy turbulent diffusion and on the effluent deposition velocity. The plume depletion fraction for tall stacks appeared not greatly affected by different surface roughnesses which were significant at all distances for short stacks. The distance necessary for depletion to become important increased with increasing stability; although, once begun, the depletion was more rapid and more complete as the stability tended toward neutrality. The relative efficiency of a forest as a remover of effluent material suggested the use of such a region for filtering of particulate and gaseous emissions where concentrations are small enough to void biological damage.

37262 **APTIC NO. 59750**

Jacobowitz, H. and K. L. Coulson

EFFECTS OF AEROSOLS ON THE DETERMINATION OF THE TEMPERATURE OF THE EARTH S SURFACE FROM RADIANCE MEASUREMENTS AT 11.2 MICRON. *National Oceanic and Atmospheric Administration, Washington, D. C., National Environmental Satellite Service and California Univ., Davis, Rept. NOAA-TR-NESS-66, 21p., Sept. 1973. 8 refs.*

GPO

The influence of atmospheric aerosols on outgoing terrestrial radiation in the window region at 11.2 micron is estimated by atmospheric modeling. Nine different particle size distributions, three vertical aerosol concentration profiles, and five vertical temperature profiles are considered for a total of 135 atmospheric models. For each model, the upward radiant intensity was computed for every 0.2 km from the surface to 20 km. From these values, equivalent black-body temperatures were determined as a function of height, and the error in the derived surface temperature due to aerosols was computed. The absorption by aerosols is dominant over emission, making the deduced surface temperature lower than actual, except in the subarctic winter. Errors were generally less than 2 K except under extreme conditions. (Author abstract)

37263 **APTIC NO. 59522**

Johnson, Warren B., Jr., Robert J. Allen, and William E. Evans

LIDAR STUDIES OF STACK PLUMES IN RURAL AND URBAN ENVIRONMENTS. (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract CPA 70-49, Proj. Element 1AA009, SRI Rept. 8509, EPA-650/4-73-002, 109p., Oct. 1973. 7 refs.*

NTIS: PB 227347/AS

Smoke plume diffusion and pollution-layer structure were studied in field tests in rural and urban areas using a mobile lidar system. First smoke plumes from 250 m stacks of a large coal-burning power plant were studied. Plume diffusion changes and low-level aerosol structure changes resulting from time-varying meteorological conditions were presented as vertical plume cross sections. Helicopter-measured sulfur dioxide cross sections and the lidar-obtained smoke cross sections were compared on a case-study basis. Estimates of diffusion parameters derived from the lidar observations were compared with those used in a fluctuating plume diffusion model. The mobile lidar observations in urban areas (San Jose, California, and St. Louis, Missouri) revealed significant variations in the pollution-layer structure associated with urban effects, transitional meteorological conditions, and apparent convective influences. The eye-safety aspects of lidar use in the atmosphere were also studied. The probability of eye damage from lidar usage under current operational procedures is extremely small. However, remedial suggestions are offered for reducing the eye hazard even further.

37264 **APTIC NO. 59821**

Koji, Masahiro and Kosaku Ozaki

THE RELATIONSHIP OF OXIDANTS TO WIND OF MT. ROKKO. *(Okishidanto to Rokko sanjo no kaze to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):573, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 296.)*

The relationship between the wind on Mount Rokko (1000 m) near Kobe and the oxidant concentration on the ground level was investigated. The anemometer of Rokko is installed at 900 m. On days of high oxidant concentration (more than 10 pphm at the shore), the wind on Rokko is extremely weak, generally between 2 and 4 m/sec. Generally, the wind velocity within an inversion layer is very small. Therefore, the weak wind on the mountain indicates the presence of an inversion layer or stagnation. High concentration does not occur when the early morning wind direction is SE, S, or W. The peaks usually appear during the day, but occasionally another peak appears between 4 and 6 pm. This is not a local phenomenon but seems to cover the greater area of Kobe. Usually the wind on Mount Rokko becomes stronger in the afternoon and continues into the evening. On the days of high oxidant peaks in the evening, the wind seems to increase in the afternoon, but reverses the condition and becomes weak, and the concentration peak on the ground coincides with the minimum wind on the mountain. Based on the conjecture that a high ozone concentration at the higher altitude might be brought down by a current toward the evening, the wind velocity on the ground was studied. High oxidant peaks coincided with an increase of wind on the lower level.

37265 **APTIC NO. 59499**

MacCracken, M. C.

FIRST ANNUAL REPORT, DOT-CIAP PROGRAM. *California Univ., Livermore, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-Eng-48, Rept. TID-4500, UC-53 Meteorology, UC-4 Chemistry, 233p., Feb. 13, 1973. 303 refs.*

NTIS: UCRL-51336

Summaries are presented for numerical models developed to determine the effects on global climate caused by large numbers of aircraft operating in the stratosphere; the numerical model studies were undertaken by the Lawrence Livermore Lab. as part of the Climatic Impact Assessment Program of the Dept. of Transportation. The models apply to dispersion and transport, global transport and kinetics, zonal atmosphere, stratospheric kinetics, and solar and ultraviolet radiation transport. Appendices are also provided for meteorological guidance, support of monographs, and a summary of meetings, visits, conferences, and papers submitted.

37266 **APTIC NO. 60080**

Maniak, Elzbieta, Henryka Manterys, and Leopolda Nawara

THE DISPERSION OF PARTICULATE AND GASEOUS POLLUTANTS AROUND INDUSTRIAL PLANTS. *(Rozprzestrzenianie sie zanieczyszczen pylowych i gazowych wokol zakladu przemyslowego). Text in Polish. Czas. Tech., 77(2):47-51, 1973. 9 refs.*

The dispersion of pollutants around the engine room of the Janina coal mine at Libiaz was studied at distances of 72, 88, 89, 145, 190, 250, 350, 355, 450, 500, 575, and 640 m in different directions from the emission source. Sulfur dioxide was studied by the sedimentation method. Meteorological measurements were made at 12 locations. The quantities of particulates deposited at the given locations are subject to irregular variations during the year. In many places the drop depends on the frequency of wind direction change. The highest concentration of pollutants was found around the emission source. The lowest values for SO2 occur in the summer months; the highest in winter. Analysis of the atmospheric dispersion of the pollutants indicates the main direction of their transport in the atmosphere.

37267 **APTIC NO. 59618**

Mazzarella, Daniel A.

METEOROLOGICAL SENSORS IN AIR POLLUTION PROBLEMS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 257-269, 34 refs. (Dec. 10-12, Paper ISA JSP 6702.)*

Meteorological sensors with applications in pollution problems encompass all the elements of weather. In the efforts related to diffusion and turbulence, the primary sensors are those that measure wind and temperature; the secondary sensors are those that measure dew point (humidity), solar radiation, pressure, precipitation, and such other variables of the atmosphere as are important, but do not usually provide inputs used in calculating the dispersion of an atmospheric contaminant. Of all the measurements made, or determined, the standard deviations of wind in the horizontal and vertical plane have been used most often as parameters in the equations for diffusion. While most early investigations in this field were research-oriented, a major part of today s work is applications-oriented, and frequently includes measurements of air quality in urban and interstate networks. Another change is evolving. The analog strip chart recorder is still important but in a secondary role to the telemetered, automated, computer-compatible digital record. The use of towers as platforms for sensors has continued and increased, with little change in the basic measurements, but most certainly, there is a greater recognition of the importance of sensor characteristics as part of the total system. (Author abstract)

37268 **APTIC NO. 59617**

Miller, Albert

POLLUTANT DISTRIBUTIONS IN WEST COAST INVERSIONS. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 287-293. 8 refs. (Dec. 10-12, Paper ISA JSP 6705.)*

Aircraft and surface measurements of the ozone concentration in the San Francisco Bay Area have been related to the atmospheric circulation and the dynamics of the elevated temperature inversion that prevails along the west coast. Case studies are available when the onshore flow of maritime air was very weak and also when there was a well-developed sea breeze. In the stagnant cases, the oxidant concentration increased at all levels from the surface to 2500 m or more immediately after the breakdown of the early morning temperature inversion and reached a peak in the late afternoon; in the evening, the concentration decreased much more rapidly below the readiation inversion than it did above the inversion. In the sea breeze cases, narrow, deep zones of high concentration move along the sea breeze front, inland of where the inversion disappears. Layers of high oxidant concentration have been found several hundred m above the inversion base, under flow conditions that appear to preclude an explanation of horizontal transport, giving rise to speculation that there is a vertical transport into the inversion by wave action. Some observations of oxidant concentration delineate well-defined wave patterns. A newly instrumented tower in San Francisco may provide data on the flux of pollutants into the inversion by waves; some preliminary results are presented. In order to measure the turbulent fluxes of pollutants by waves, faster response sensors will be required. (Author abstract)

37269 **APTIC NO. 59227**

Mills, M. T. and J. S. Olson

A MODEL FOR SUSPENSION AND ATMOSPHERIC TRANSPORT OF DUST. *Preprint, American Geophysical Union, 37p., 1973. 10 refs. (Presented at the American Geophysical Union, Fall Annual Meeting, San Francisco, Calif., Dec. 10-14, 1973.)*

A computer model was developed which treats the suspension and subsequent atmospheric transport of fine dust particles as a process initiated by the saltation of sand-sized grains. The saltation rate (g/m/sec) is calculated for a surface of known particle size distribution, assuming a wind speed versus time relationship from a typical Great Plains dust storm. The dust suspension rate (gm/sq m/sec) is approximately determined from hourly saltation values and used as an area source strength in the Sutton equation to give ground level air concentrations and deposition rates at different distances from the center of a dust covered area. The model also predicts the migration of the boundaries of this area due to the bulk movement of the sand-sized material. Most of the dust transport occurs during the relatively few hours of highest wind speed and is reduced considerably by the presence of even small amounts of vegetation. The results of this model can be applied to study future location and treatment of potentially toxic mill tailings. (Author abstract modified)

37270 **APTIC NO. 59951**

Nakajima, Y., A. Kawashima, T. Kirimoto, M. Yoshino, and T. Nakajima

OPTIMUM PARAMETER OF PLUME MODEL IN URBAN AIR. *(Plume moderu ni okeru saiteki parameta ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):391, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

A procedure for obtaining optimum parameters of plume model for the prediction of total emission of a number of polluting sources was described mathematically. The optimum parameters can be obtained from observed data of the total emission by the non-linear least square method and fitted to a specific area by correlating with the meteorological conditions. The common parameters were determined by Pasquill s dispersion equation by using six different patterns which were obtained experimentally. Two common parameters were also determined from two sets of parallel lines.

37271 **APTIC NO. 59367**

Nikitinskaya, N. I., O. D. Barteneva, and L. K. Veselova

VARIATIONS OF THE ATMOSPHERE S SPECTRAL (OPTICAL) AEROSOL THICKNESS UNDER CONDITIONS OF HIGH TRANSPARENCY. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 9(4):437-442, 1973. 10 refs.*

Variation of the spectral aerosol component curves of atmospheric thickness was considered for the wavelength range 0.37-1.10 micron, with the transition from very high to more moderate transparencies. Observations were made at the village of Sosnovo, Leningrad Oblast, over a span of 58 days, 10 of these being distinguished by the prevalence of stable atmospheric conditions. Bouguer lines obtained on one of the optically stable days showed no differences in trend before and after noon in the longwave parts of the spectrum; while all of the forenoon intensities for the shortwave segments of the spectrum exceeded the afternoon values, the quasilinear trend of the lines being preserved. Aerosol component of the atmospheric optical thickness remained unchanged in the longwave part of the spectrum, while changing in the shortwave portion. Analysis of the results and a comparison of observed and calculated data indicated preferential growth of small particles with increasing turbidity, the rare occurrence of this type of scattering apparently being explained by the narrowness of the particle size distribution which was nearly monodisperse.

37272 **APTIC NO. 59283**

Nishida, Kaoru, Yutaka Itakura, Takeo Yamamoto, and Tomonori Ohashi

PREDICTION OF URBAN AIR POLLUTION LEVELS BASED ON WIND TUNNEL EXPERIMENTS. *(Fudo jikken ni motozuku baien hassei shisetsu kara no jugo osendo no suitei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):389, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 128.)*

Dispersion of pollutants from separate emission sources were tested using wind tunnels, and the complex pollution from a multiple number of sources were calculated. The Kobe area was taken as a model of three dimensional topography, a lattice of 500 m distance was formed on the model surface, and 556 sampling openings and 32 model stacks were provided. The experimental wind velocity was 3 m/sec, the tracer gas was ethane (C_2H_6, molecular quantity 30), and the emission speed was 60 cu cm/min. The tracer gas emitted from the stack was sampled from openings of the model, and the ground concentration distribution was measured by non dispersive infrared analyzer. Plots were taken based on the ground measurements, tracer concentration, wind velocity, effective stack heights, and emission quantity per unit time.

37273 **APTIC NO. 59364**

Oroshich, T. I., A. A. Kocheyev, I. G. Deminov, K. N. Kutsenogiy, and B. M. Goldman

SIMULTANEOUS MEASUREMENTS OF THE AEROSOL CONCENTRATIONS AND OF THE ELECTRIC CONDUCTIVITY IN THE LOWER 90 KM LAYER OF THE ATMOSPHERE. *(Odnovremennyye izmereniya kontsentratsii aerozoley i elektricheskoy provodimosti v atmosfere do 90 km). Text in Russian. Kosmich. Issled., 11(6):897-902, 1973. 17 refs.*

Results of simultaneous measurements of the aerosol concentration and of the electric conductivity in the lower 90 km layer of the atmosphere by means of rocket-mounted instruments are presented. The aerosol particle count in the lower 11-22 km layer of the atmosphere was in a range of 2-5/cu cm to fall to 0.2-0.002/cu cm between 30 and 50 km. The particle count measured in certain layers between 60 and 80 km was 0.01/cu cm. Negative correlation between the aerosol particle concentration and the electric conductivity was established.

37274 **APTIC NO. 60326**

Pandolfo, Joseph P. and Clifford A. Jacobs

TESTS OF AN URBAN METEOROLOGICAL-POLLUTANT MODEL USING CO VALIDATION DATA IN THE LOS ANGELES METROPOLITAN AREA VOLUME II, FORTRAN PROGRAM AND INPUT/OUTPUT SPECIFICATION. *Center for the Environment and Man, Inc., Hartford, Conn., Environmental Protection Agency, Office of Research and Monitoring Contract 68-02-0223, Program Element A11009, EPA-R4-73-025b, 146p., May 1973.*

Input deck makeup and FORTRAN IV listings are presented for an urban meteorological-pollutant model using carbon monoxide validation data in the Los Angeles metropolitan area.

37275 **APTIC NO. 60241**

Rao, M. N. and A. K. Dutta

AIR POLLUTION AS A FLUID MECHANICS PROBLEM. *Indian J. Environ. Health, 15(2):127-132, April 1973. 23 refs.*

The process of air pollution is examined as a fluid mechanics problem, requiring the knowledge of meteorological and topographical factors affecting the diffusion process, and a review is made of existing solutions to the pollutant diffusion problem. The problem of atmospheric diffusion of pollutants, particularly from chimneys, is conveniently considered in two distinct phases: the rise of bent plumes to a quasi-asymptotic height due to buoyancy and momentum when subjected to a more or less constant wind and the subsequent diffusion of the pollutants to the atmosphere. When the velocity of the plume becomes small compared with that of the surrounding air, environmental turbulence dominates as the main diffusing agency. The path of the pollutant cloud next depends mostly on diffusivity and wind which are dependent on meteorology, topography, and atmospheric stability. Most of the existing analytical solutions of the diffusion problem have been obtained for very ideal cases; viz., for constant or simple distribution of mean horizontal wind represented by a power law, (flat and impervious ground), constant or simple power law variation of the diffusion coefficient, (smooth or uniformly rough terrain), and for neutral atmosphere. An exact point source numerical model would seem to be adequate for the estimation of the pollution level of cities, both from static industrial sources and from moving vehicle sources; however, only high speed digital computers could perform the task, and the cost would be extremely high.

37276 **APTIC NO. 59564**

Reynolds, S. D.

URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY VOLUME I - DEVELOPMENT AND EVALUATION APPENDIX D: NUMERICAL INTEGRATION OF CONTINUITY EQUATIONS. *Systems Applications, Inc., Beverly Hills, Calif., Environmental Protection Agency Contract 68-02-0339, Program Element 1A1009, EPA-R-73-030e, 45p., July 1973. 8 refs.*

A comphrensive discussion of the methodology used to obtain the numerical solution of the governing airshed equations is presented. Further studies and changes were made in the numerical scheme described in Appendix D of Roth et al (1971). The motivation for making these changes is discussed and a complete description of the finite difference equations that were adopted is included. All simulation results included in the final report were obtained using the numerical methods described.

37277 APTIC NO. 59573

Reynolds, S. D.

URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY. VOLUME II - USES S GUIDE AND DESCRIPTION OF COMPUTER PROGRAMS. *Systems Applications, Inc., Beverly Hills, Calif., Environmental Protection Agency Contract 68-02-0339, Program Element No. 1A1009, EPA-R4-73-030f, 193p., July 1973. 1 ref.*

A user s guide which includes computer program description is presented for a dynamic simulation model developed to predict ground level, urban concentrations of inert and photochemically reactive atmospheric contaminants and their variations in space and time. Descriptions, listings, symbol glossaries, and sample outputs are provided for the emissions data preparation program, the meteorological data preparation program, the atmospheric pollution simulation program, and the data plotting program. The codes included in the guide reflect some the characteristics which are unique to the Los Angeles airshed since this region was the first extensive application of the model, although the computer programs have been structured for general use rather than for exclusive application to a particular airshed. Minor modification of the codes may be required for any specific application to account for individual airshed characteristics which are not treated in the general formulation of the model or codes.

37278 APTIC NO. 59244

Roberts, P. J., Mei-Kao Lui, S. D. Reynolds, and P. M. Roth

URBAN AIR SHED PHOTOCHEMICAL SIMULATION MODEL STUDY. VOLUME I - DEVELOPMENT AND EVALUATION. APPENDIX A - CONTAMINANT EMISSIONS MODEL AND INVENTORY FOR LOS ANGELES. *Systems Applications, Inc., Beverly Hills, Calif., Environmental Protection Agency Contract 68-02-0339, Program Element No. 1A1009, EPA-R4-73-030b, 57p., July 1973. 12 refs.*

Documentation is presented for all modifications and extensions which were implemented to improve the accuracy or resolution of a pollutant emissions inventory for the Los Angeles Basin for use in the photochemical modeling of the transport, diffusion, and reaction of atmospheric contamination. Pollutant sources were grouped into five categories, viz., automobiles (and other motor vehicles), aircraft, power plants, refineries, and distributed fixed sources. Emissions rates for a 2 by 2-mile grid system covering the Basin were compiled for nitrogen oxides, carbon monoxide, and hydrocarbons. Changes applicable to all portions of the inventory have been included in an introductory general section.

37279 APTIC NO. 60156

Seki, N.

MEASUREMENT OF ULTRAVIOLET RADIATION IN THE LOW ATMOSPHERE. *(Tei taikichu no shigaisen ryo sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):613, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 33.)*

Ultraviolet and visible radiations were measured with an integrating illuminometer at longitude 140 deg 5 min E, and latitude 36 deg 6 min N. and at an altitude of approximately 40 m. Ultraviolet radiation was measured at 300 to 400 nm while visible radiation was measured at 400 to 700 nm. Results indicated that noticeable relationship existed between the two radiations. The correlation coefficient was 0.96 for July 1972, and 0.91 for Dec. 1972. Ultraviolet radiation measured at a location 7 km away revealed a variation of 4.38 to 6.45% of the monthly radiation. July was the month with the highest radiation, while December the lowest. The hourly integrating value showed periodical changes for three consecutive years.

37280 APTIC NO. 59644

Sklarew, R. C., D. B. Turner, and J. R. Zimmermann

MODELING AIR POLLUTION CONCENTRATION NEAR HIGHWAYS. *VDI (Ver. Deut. Ingr.) Ber., no. 200:97-103, 115-121, 1973. 8 refs. (Presented at Kolloquium Ausbreitung luftverunreinigender Stoffe, Berechnungsmethoden und -Modelle (Punkt- und Mehrfachquellen), Duesseldorf (Germany), Nov. 20-21, 1972.)*

To predict the environmental impact of highways, air pollution concentrations near highways must be estimated. Monitoring must be done near the highway and out to several hundred meters and for different roadway configurations such as grade level, elevated, and depressed. For cases where only horizontal wind flow occurs (grade level roadways), a model using a Gaussian concentration distribution can be applied with an initial vertical Gaussian distribution representing the dispersion generated by automobiles. For situations where the roadway alters the structure of the wind flow (elevated and depressed roadways), a grid model using a diffusivity approach may be more appropriate. The total concentration at a location is estimated by adding the concentration calculated by the highway model to the concentration from other upwind sources calculated by using an urban or regional model. Both types of models are described, their validation status is reviewed, and the results of a few calculations are presented. (Author abstract modified)

37281 APTIC NO. 60159

Suzuki, Tadao, Nobuo Igarashi, Toru Imai, and Yoshio Komaki

FIELD SURVEY BY SMOG CHAMBER MOBILE (II). *(Idoshiki sumoggu chanba ni yoru firudo sabe (dainiho)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):562, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 285.)*

Atmospheric photochemical reaction experiments were conducted since summer of 1972 using a mobile smog chamber. The chamber is an aluminum frame structure covered by teflon and has approximately 5 cu m capacity, and the test gas is radiated by 144 ultraviolet fluorescent lights at 9.5 mW/cu cm. A continuous analysis is given and the air is supplied for dilution of formed gas. With the experiments, three types of reactions were recognized with oxidants, nitric oxide, and nitrogen dioxide. The reactions were not affected by location or time, but by the duration of sampling time, and seemed to belong to the Los Angeles type reaction. The correlations of initial NOx concentration and chamber oxidant concentration are 0.57 in summer and 0.72 in winter. When the ratio of total hydrocarbon/NOx is small, oxidant formation quantity is larger; when the ratio is larger, the formation quantity is larger; when the ratio is larger, the formation quantity shows a given tendency. The maximum oxidant formation was 0.6 ppm on Feb. 14, 1973; the initial NO concentration was 0.32 ppm and maximum NO2 0.5 ppm.

37282 APTIC NO. 59365

Tavartkiladze, K. A.

DETERMINATION OF THE COEFFICIENT OF AEROSOL-INDUCED ATMOSPHERIC TURBIDITY. *(Opredeleniye koeffitsienta aerozol nogo pomutneniya atmosfery). Text in Russian. Meteorol. i Gidrol., no. 11:96-103, 1973. 2 refs.*

A simple formula for the determination of the solar radiation intensity at a given altitude above sea was derived from the Beer-Buger equations. The solar radiation intensity was a function of the direct solar radiation, the atmospheric turbidity coefficient, the water vapor content in the atmosphere, and the height of the homogeneous aerosol atmosphere. The formula is valid for altitudes of up to 0.5 km above sea, water vapor contents of 1-2 g/sq cm, and aerosol turbidity coefficients of 0.03-0.15. The influence of both ozone and carbon dioxide in the atmospheric turbidity was negligible.

37283 **APTIC NO. 59652**

Valera, Manuel D.

MODERN MEANS OF PROTECTION AGAINST ATMOSPHERIC EMISSIONS. *(Protecciones modernas contra descargas atmosfericas). Text in Spanish. Ingenieria (Mexico City), vol. 75:5-17, June 1973.*

The sources of electricity are cumulo-nimbus and nimbus clouds, the earth itself, and the air. Cumulo-nimbus clouds can be considered a dipole, which in 95% of the cases, have their upper part charged positively and their lower part negatively. The land constitutes the other plate of the condensor. Before the powerful negative electric field is found in the base of the cloud, a charge of equal value is induced. The earth contains both positive and negative ions. The air is theoretically a good electric insulator, but against the insulation capacity is the greater or lesser capacity of ionization which can be present for many reasons. The air can raise sufficient energy to extract an electron under external bombardment. Franklin s point, the work of D Alibard, Faraday, Melsen s protection, Szillard, Dauziere, and Capart are summarized.

37284 **APTIC NO. 60155**

Watanabe, Hiroshi, N. Takada, Masanori Yoshioka, Saburomaru Tsujimoto, and Norio Oki

ON DIFFUSION AND REACTIVITY OF CO, NOX, AND HC IN POLLUTED AREA. *(Jidosha haishutsu gasu ni kiin suru osen mekanizumu ni kansuru kenkyu (daiippo) CO, NOx, HC no kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):549, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 274.)*

To investigate the pollution mechanism by automotive exhaust gas in factory areas, the correlation of carbon monoxide with nitrogen oxides and hydrocarbons were examined. Investigations were conducted at a busy intersection of Kobe in spring and near an Amagasaki factory and the adjacent Takarazuka city in summer. A nondispersive infrared detector was used for the traffic intersection measurements: a methane reduction flame ionization detector was used for other two areas with lower CO concentrations. The NOx were measured by Saltzman automatic recorder, and HC were measured by liquid oxygen concentration and gas chromatography. At the traffic intersection, toluene concentrations were 20-150 ppb; n-hexanes were 10-30 ppb; ethylene concentrations were 10-50 ppb; and ethane, propane, butane, propylene, and acetyle were all 5-20 ppb. In Takarazuka, the composition distributions were similar to those of Kobe, but the concentration levels were 1/5 of Kobe. In Takarazuka, the correlations of CO with NOx and HC were high, and similar relationships to those at Kobe were noted. In Amagasaki, the relationship of CO and NOx suggested complex pollution from factory and automobile sources. In the summer, when oxidant concentration is high, the relative concentration of NOx to CO diminishes. Ethylene concentration also diminishes in reverse proportion to Ox concentration.

37285 **APTIC NO. 59623**

Wendell, Larry L.

SOME INFLUENCES OF REGIONAL BOUNDARY LAYER FLOW ON ATMOSPHERIC TRANSPORT AND DISPERSION. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 271-278. 6 refs. (Dec. 10-12, Paper ISA JSP 6703.)*

The scales on which most atmospheric transport and diffusion work has been carried out have been either within less than a few km or over long distances (i.e., more than 400-500 km). Only recently has serious attention been turned to the intermediate scale of 10-100 km. It is on this regional scale in the boundary layer of the atmosphere that air pollution problems are becoming more critical. Recent investigations in several areas of the western United States have shown that the atmospheric transport of pollutants is strongly affected by intermediate scale variations in the topography. This spatial variation in the flow can cause serious error in both short-term emergency forecasts of plume transport and long-term site evaluation studies based only on the source winds. Instances of large vertical shear in wind speed and direction may also be traced back to regional scale variation in terrain height. Thus, a knowledge of intermediate scale terrain configuration and associated wind patterns can provide valuable insight for the interpretation and analysis of pollution measurements. (Author abstract)

37286 **APTIC NO. 59274**

Wolfermann, H. F.

SPREAD OF MALODOROUS EMISSIONS FROM AREA SOURCES. *(Ausbreitung geruchsintensiver Stoffe bei Flaechenquellen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:221-223, 1973.*

Experiments on the dispersion of malodorous emissions from cattle barns are described. The specific odor of barn emissions is due to the presence of protein decay products, such as trimethylamine, hydrogen sulfide, ammonia, indole, and skatole. Emissions from cow barns are discharged at 1.80-2.00 m altitude or immediately underneath the roof. Odors are perceptible usually at distances of up to 200 m. The dilution of the emissions is heterogeneous, because alternate zones of odorless air and malodorous air were observed. The odor nuisances are most intense during periods with high ambient temperature and low wind speed. Dilution factors of 380 m in a calm atmosphere, 156 at a wind speed of 3 m/sec, and 440 at a wind speed of 5 m/sec were determined at 6 m distance from the outlet. Effective dilution of malodorous emissions requires dilution immediately after the emission source. Emissions close to the ground level should be avoided.

37287 **APTIC NO. 59286**

Yamamoto, Susumu and Osayuki Yokoyama

AIRPLANE MEASUREMENTS OF ATMOSPHERIC DIFFUSION OVER A CITY. *(Toshi ni okeru taiki kakusan no hikoki kansoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):392, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 131.)*

The intensity of turbulence and the quantity of heat transport were measured above Tokyo and south Saitama. An airplane was used, and the three-dimensional distribution in the city and suburbs, time variations, and the structure of atmsopheric interfaces and pollutant dispersions within layers were examined. The tests were conducted in August of 1972 and 1973. The turbulence was measured by thermal line anemometer and ultrasonic anemometer-thermometer at the heights of 200, 300, 500, 700, 1000, 1500, and 2000 m, in the direction of wind for 30 km. Each flight at a given height was divided into several run sections, and the parameters of the main wind, vertical elements, thermal fluctuations, and thermal transport were examined.

1972

37288 **APTIC NO. 59217**

Benarie, M., A. Nonat, and T. Menard

STUDY OF THE TRANSFORMATION OF SULFUR DIOXIDE TO SULFURIC ACID IN RELATION WITH CLIMATOLOGIC DATA IN AN INDUSTRIALIZED URBAN AREA (ROUEN). *(Etude de la transformation de l anhydride sulfureux en acide sulfurique en relation avec les donnees climatologiques, dans un ensemble urbain a caractere industriel (Rouen)). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 37p. 38 refs. (May 3-5.)*

The atmospheric oxidation of sulfur dioxide to sulfuric acid aerosol was studied during the winter of 1969/1970 at seven sites in the Rouen region. The H_2SO_4 studied was that determined selectively by the microdiffusion method and not the stochiometric value computed from hydrogen ion or sulfate concentrations. The reaction is governed by the catalytic action of the suspended solid matter. Compared with this influence, the acceleration of the reaction by ammonia appears slight, and the action of nitrogen dioxide seems even less definite. No photochemical action is perceptible. The overall effect of fog is rather of diminution of the H_2SO_4 aerosol concentration. Under the observed conditions, and with the approximating assumptions which are made, the lower limit of estimation of the reaction rate is between 6 and 25% per hour. As a mean value, during wintertime, in the Rouen region, 7.1% of the total airborne sulfur of the atmosphere is in the form of H_2SO_4.

37289 **APTIC NO. 59540**

Bringfelt, Bjorn and Olof Wikstrom

MATHEMATICAL SYSTEM FOR CALCULATIONS OF SPREAD OF AIR POLLUTION IN THE GREATER STOCKHOLM AREA. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris France, 1972, p. XX-1-XX-17. (Oct. 2-3.)*

A mathematical system for calculating the spread of discharged pollutant materials has recently been developed for the city of Stockholm, Sweden. Development of the system involved first the preparation of meteorological data, source data, emission data, and values for observed pollution content over a predetermined period of time. Calculation of pollution estimates on the basis of meteorological and emission data was performed by a collection of 12 computer programs. Estimated and observed concentrations of released impurities were then compared, and the pollution situation for various alternative planned amounts and positions of discharge was calculated. The system presupposed that every discharge was spread in the form of a uniform column of smoke, and the column was assumed to move away in a consistent wind whereby it expands and is diluted by turbulence. Ground level concentrations were estimated on the basis of the amount of discharge, the height of the chimney or stack, and the meteorological data. Agreement between estimated and observed values of sulfur dioxide ground level concentrations for the city appeared good.

37290 **APTIC NO. 59908**

Calder, Kenneth L.

MATHEMATICAL MODELING OF AIR QUALITY THROUGH CALCULATION OF ATMOSPHERIC TRANSPORT AND DIFFUSION. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. X-1-X-21, 1972. 57 refs. (Oct. 2-3.)*

Some of the more important aspects of mathematical modeling of air quality are reviewed in general qualitative terms with emphasis on the prediction of sulfur dioxide concentrations. The modeling considered refers to the calculation of atmospheric transport and dispersion, once the intensity and distribution of pollutant emissions has been specified and thus provides a rational basis for analysis of air quality in terms of the release of pollutants. Problems of multiple-source urban diffusion modeling are also considered. Numerous references are provided for recent literature on the subject. (Author summary modified)

37291 **APTIC NO. 59928**

Clarenburg, Louis A.

AN AREA SOURCE MODEL WITH STATISTICAL INPUT, ITS VERIFICATION AND ITS VALIDATION; A STANDARD FOR ODOROUS POLLUTION. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XV-1-XV-13. 5 refs. (Oct. 2-3.)*

An area source model of odorous pollution, relating perceptive capabilities of the population to production factors, meteorological parameters, and distance, has been developed. The model consists of a diffusion part and a perception part and is based on the assumption that odor emerges from numerous sources which are randomly spread over the terrain considered. The strengths of all these sources are considered as belonging to a (nonspecified) statistical distribution. Integration of the contribution of a cross-wind row of sources situated in a band (delta x) to the concentration at any one downwind site and subsequent integration in the wind direction results in an expression for the total odor concentration. Validation of the diffusion part of the model has been performed by computing the seasonal mean sulfur dioxide concentrations at various sites in The Hague and Amsterdam and hourly mean SO_2 concentrations and their seasonal distribution as a function of wind direction at the same sites in the same cities. Correspondence was surprisingly close between computed and observed data. Validation of the perception part was performed by prediction of the results of a sociological poll concerning air pollution nuisances; correlation between predicted and observed results was again very good. The results of the model and its validation have led to the establishment of a standard for odorous pollution by the Rijnmond Council.

37292 **APTIC NO. 59457**

Daye, Richard L.

AFGWC AIR STAGNATION MODEL. *Air Force Global Weather Central, Offutt AFB, Nebr., Systems Analysis and Design Branch, AFGWC(DN)TN-72-6-1, 12p., May 15, 1972. 8 refs.*

NTIS, DDC: AD 743304

An air stagnation model was designed to provide air stagnation data to Air Force installations located overseas where mesoscale data are available. Parameters were derived from boundary layer model data and mesoscale prediction model data. Precipitation forecasts from a macroscale cloud module were also used. Since the boundary layer model forecasts were only available through 24 hours, the 36-hour outlook used data from a macroscale baroclinic prediction model, the macroscale cloud module, and the 1000-mb prognostic model. The air stagnation data included mixing depth, transport wind in the mixing layer, ventilation value in the mixing layer, meteorological stagnation index (MSI), times of maximum and minimum MSI, and the maximum and minimum MSI. (Author abstract)

37293 **APTIC NO. 59464**

Deirmendjian, D.

ON VOLCANIC AND OTHER PARTICULATE TURBIDITY ANOMALIES. Rand Corp., Advanced Research Projects Agency Contract, 54p., March 1972. 47 refs. (This is a condensation of R-886-ARPA.)

NTIS, DDC: AD 748975

Information on anomalous, long-lived changes of turbidity over large portions of the earth are reviewed in order to estimate the amount and nature of the turbid components in each case. This information in turn may be correlated with the nature and magnitude of the climatic effects, if any, in an effort to understand the responsible mechanism so that future effects can be predicted. Volcanic explosions cause one type of large turbidity anomaly by injecting large quantities of volcanic dust into the atmosphere which can alter its normal optical properties. Literature is reviewed on three volcanic events which occurred within the last 100 years and produced widespread turbidity anomalies, Krakatoa, Katmai, and Agung. Various optical phenomena are discussed including blue or green sun and moon, Bishop s Ring, and twilight and crepuscular phenomena. Climatic effects of volcanic dust include reduction of insolation, and reduction of mean temperature, related to the magnitude of dust and the optical thickness anomaly. Supersonic aircraft emissions may also cause particulate loading and meteorological changes; however, some studies show that SST turbidity anomalies will hardly exceed the background turbidity found above mountains on clear days away from city pollution, and thus climatological disturbances may be negligible.

37294 **APTIC NO. 59927**

Gronskei, Knut Erik

A THREE-DIMENSIONAL TRANSPORT MODEL FOR AIR POLLUTION IN AN URBAN AREA WITH APPLICATION TO SO2 CONCENTRATION IN OSLO. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XXII-1-XXII-39. 10 refs. (Oct. 2-3.)*

GPO

A three-dimensional mathematical transport model for considering systematic vertical motion and unhomogeneous horizontal motion in modeling air pollution near the ground has been developed and applied to predicting sulfur dioxide concentrations in Oslo, Norway. The model involves a continuity equation which is integrated vertically, and the town represents a permanent heat source relative to its surroundings which causes vertical motions. A wind model was developed and worked fairly well in 11 case studies during the winter, giving reasonable wind estimates even during periods with weak wind conditions that are often observed in Oslo. Ventilation was considered in an approximately correct way, although only about half of the short term variance in the measured SO2 concentration was explained. Different terms of the model s equation were integrated over the Oslo region to show the relative importance of different removal processes of SO2 from ground level, and the results were recorded in percent of SO2 emission. Removal by vertical transport accounted for 40-80%, that by horizontal transport for 0-50%, and removal by an applied sink-term for 5-20%. Pollution within the city was found tolerable despite the high frequency of stagnating periods during the winter due to the organized vertical lifting of the air.

37295 **APTIC NO. 60346**

Hirt, Fritz-Hellmut and Henning Kellersmann

AERIAL PHOTOGRAPHS. INFRARED EMISSION MEASUREMENTS AS A NEW SOURCE OF INFORMATION FOR PLANNING PURPOSES. *(Luftaufnahmen. Waerme-Infrarotmessungen als neue Informationsquelle fuer Planungszwecke). Text in German. Schriftenreihe Siedlungsverband Ruhrkohlenbezirk, no. 44:1-70, 1972. 21 refs.*

Aerial infrared pictures were taken of cities and industrial areas in the Ruhr region in West Germany by means of a tape recorder-connected Zyklop scanner. Aerial pictures of one urban area revealed increased atmospheric radiation in the polluted atmosphere, and furnished relevant data on the radiation balance. Also, reduction of the effective irradiation, of the direct solar radiation, increase of the albedo, and increase of the global radiation budget in polluted areas were determined from the heat pictures.

37296 **APTIC NO. 59234**

Jansen, P., S. Jordan, and W. Schikarski

COMPARATIVE MODEL THEORY OF THE ATMOSPHERIC POLLUTANT LOAD CAUSED BY POWER PLANTS. *(Vergleichende Modelltheorie der atmosphaerischen Schadstoffbelastungen durch Kraftwerke). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. 32 refs. (May 3-5.)*

A model theory of the air pollutant loads caused by conventional and nuclear power plants, and future development of the pollutant loads on the basis of the expected energy production and of the maximum allowable ground level concentrations is presented. The pollutants concerned are sulfur dioxide, nitrogen oxides, dust, and fluorine compounds as well as xenon-113 and krypton-85. The specific SO2, dust, nitrogen oxide, and fluorine emissions from coal are 6.0-7.7; 1.4-2.7; 1.4-4.6, and 0.05-0.11 g/per kWh. The corresponding values for oil are 7.4 g of SO2, 0.7 g of dust, 1.5-3.4 g of nitrogen oxides, and 0.004 g of fluorine per kWh. Natural gas produces 0.002 g of SO2, and 0.7-3.1 g of nitrogen oxides per kWh. The hold time of air pollutants in the atmosphere is dependent of their concentrations, high concentrations corresponding to short decay times. The hold time of SO2, dust, nitrogen oxides, and fluorine in the atmosphere is 1-6 days, 3-7 days, 1-3 days, and 3-7 days, respectively. The average yearly ground level concentration of SO2 and nitrogen dioxide in polluted areas is 150 micrograms/cu m and 50 micrograms/cu m. Nuclear energy is about 1000 times less polluting than either coal or fuel oil, while natural gas is about 100 times better than the fossil fuels. The energy generation facilities operating currently are susceptible to creating considerable pollution even under normal meteorological conditions, while concentrations exceeding the maximum allowable levels by two orders of magnitude occur during inversions.

37297 **APTIC NO. 59917**

Knox, Joseph B.

ATMOSPHERIC MODELING AND ENVIRONMENTAL PROTECTION NEEDS. *Preprint, California Univ., Livermore, Lawrence Radiation Lab., 15p., Oct. 9, 1972. 28 refs. (Presented at the Interagency Conference on the Environment, Livermore, Calif., Oct. 17-19, 1972.)*

NTIS: UCRL-74249, Conf-721002-3

The atmospheric modeling capabilities of the National Laboratories pertinent to key present-day environmental questions are surveyed; and the history, problems, and future of numerical modeling are generally discussed. Current strategic areas for research and application of atmospheric modeling for environmental concerns are on the global, continental, and regional or urban scales. These needed areas are listed, and the roles of atmospheric modeling are discussed for the various scales.

37298 **APTIC NO. 59224**

Malet, L. M.

PRACTICAL METHOD FOR THE EVALUATION OF THE DILUTION FACTORS OF AIR POLLUTANTS

EMITTED BY A CONTINUOUS PUNCTIFORM HIGH EMISSION SOURCE. *(Methode pratique d evaluation des facteurs de dilution des effluents issus d une source ponctuelle elevee a emission continue). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. (May 3-5.)*

A practical method developed by the Nuclear Energy Research Center in Mol (Belgium) for the evaluation of the dilution factors of emissions from continuous, high emission point sources is described. The groundlevel concentration of such emissions can be calculated from an equation as a function of the source intensity, the dilution factor, the distance from the source, the effective discharge height, the height of an inversion layer above the effective discharge height, standard deviations of the lateral and vertical distributions of the effluents in the plume at a given distance from the source, and the mean wind speed at the plume height. A comparison of data calculated by the Mol method with tracer analyses shows good agreement of the results under similar emission conditions and for punctiform source heights comprised between 30 and 200 m.

37299 **APTIC NO. 59523**

Ranzieri, Andrew J.

AIR QUALITY MANUAL. METEOROLOGY AND ITS INFLUENCE ON THE DISPERSION OF POLLUTANTS FROM HIGHWAY LINE SOURCES. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S(1)-72-11, 169p., April 1972. 20 refs.*

A California Division of Highways air quality manual on meteorology and its influence on the dispersion of pollutants from highway line sources has been prepared as part of a personnel training program to present to the highway engineer the basic fundamentals of meteorology and their effect on pollutant concentrations on and within the highway corridor. Topics covered include: sources of meteorological data; aerodynamic and topographical influences; thermal effects; exposure of meteorological wind systems; meteorological survey; meteorological record forms; reduction of meteorological data; time periods to determine wind roses and stability; computer programs for wind roses and stability; and meteorological inputs into a highway line source dispersion model.

37300 **APTIC NO. 59453**

Read, Robert G.

AIR FLOW LAND-SEA-AIR INTERFACE. MONTEREY BAY, CALIFORNIA - 1971. *California State Univ., Moss Landing Marine Labs., National Oceanic and Atmospheric Administration Grant 2-35137, CASUC-MLML-TP-72-04, TP-72-4, MLML 29, 27p., 1972. 4 refs.*

NTIS: COM-7211137

Air-flow at the land-air-sea interface influences the atmospheric conditions that determine the dilution, transport, and trapping of natural and man-made air pollutants in the coastal areas of Monterey Bay and the Salinas Valley. The hourly air flow in these areas was analyzed on a daily and monthly basis. Patterns of stagnation were found from midnight to noon of the following day with moderate to strong air flow during 1300 to 2200 hours. Throughout 1971, whenever the flow was greater than 5 mi/hr, the prevailing wind direction was onshore and from a westerly direction. Suggestions for urbanization and industrialization are made on the basis of an understanding of the atmospheric conditions which lead to trapping and dispersal of atmospheric waste. (Author abstract)

37301 **APTIC NO. 59503**

Shirley, Earl C.

AIR QUALITY MANUAL. A METHOD FOR ANALYZING AND REPORTING HIGHWAY IMPACT OF AIR QUALITY. *California Division of Highways, Materials and Research Dept., Rept. CA-HWY-MR657082S-6-72-14, 34p., July 1972. 7 refs.*

A California Division of Highways air quality manual on the method for analyzing and reporting highway impact on air quality has been prepared as part of a program designed to train district personnel in assembling air quality reports. Topics covered include: legal requirements for environmental studies; air pollution phenomena (photochemical reactions, wind speed, turbulence, source strength, and mixing depth); pollutant effects on the air; component parts of an air quality study (characterization of source strength, transport and dispersion of pollutants, mathematical analysis, and ambient air quality); data presentation; written and tabular data summary; visual aids; response to questions for an environmental impact statement; report outline for an air quality study; building an aerometric data bank; out-of-house studies; and a systems approach to air quality studies. An actual request for proposal used by one of the California districts is included in an appendix.

37302 **APTIC NO. 59456**

Siegel, Robert

CALCULATION OF IRROTATIONAL WIND PATTERN WITH APPLICATION TO CLEVELAND TOPOGRAPHY. *Lewis Research Center, Cleveland, Ohio, National Aeronautics and Space Administration TM-X-2653, Work Unit 501-24, LRC-R-E-7039, 25p., Oct. 1972. 9 refs.*

NTIS: N73-10610

Small perturbation theory was applied to compute the deflection of the wind blowing across land that has irregular topography. The method was first applied to the flow around a single hill of Gaussian profile. Then calculations were made for the irregular topography on the east side of Cleveland where the elevation changes by several hundred feet. The topography produced small wind deflections that would not be of practical importance in air pollution dispersion studies. The calculations were for a neutrally stable atmosphere. Although they were not investigated, other factors such as thermal stratification of the atmosphere, diurnal variations, and convection currents resulting from thy proximity of Lake Erie and the city heat island effect are expected to be more significant than the influence of topography. (Author summary modified)

37303 **APTIC NO. 59507**

Smith, F. B. and G. H. Jeffrey

THE PREDICTION OF HIGH CONCENTRATIONS OF SULPHUR DIOXIDE IN LONDON AND MANCHESTER AIR. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XVIII-1-XVIII-6. (Oct. 2-3.)*

Three mathematical forecasting schemes have been developed for predicting sulfur dioxide concentrations over the cities of London and Manchester. The first was developed to provide a forecast of whether or not certain threshold concentrations will be exceeded, while the second was developed to predict the actual magnitude of the daily average concentration. The last scheme was initiated as a simplified, albeit slightly less accurate, version of the second scheme. Meteorological parameters that were found most relevant were: the minimum temperature, wind speed, wind direction, and mixing depth. The schemes generally showed very satisfactory success in both cities and were much superior to persistence forecasting (today s concentration estimate is yesterday s concentration).

37304 **APTIC NO. 59508**

Smith, F. B.

A SCHEME FOR ESTIMATING THE VERTICAL DISPERSION OF A PLUME FROM A SOURCE NEAR GROUND LEVEL. *North Atlantic Treaty Organization,* *Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Meeting, 3rd Meet., Paris, France, 1972, p. XVIII-1-XVII-14. (Oct. 2-3.)*

A new scheme is outlined which brings up to date and enlarges upon an earlier scheme by Pasquill developed to estimate vertical dispersion of a neutral plume downwind from a near ground-level source when preferred direct measurements of the vertical fluctuations of the wind are unobtainable. The scheme utilizes numerical solutions of the diffusion equation up to 100 km downwind with profiles of wind and diffusivity suggested by actual measurements in unstable, neutral, and stable conditions. Measurements long-range diffusion and a better understanding of the nature of the whole boundary layer have both contributed to the changes. Account is taken of the effects of time of day, month, surface roughness, wind speed, incoming solar radiation, and overall stability. Factors which are possibly important but have yet to be considered are: the effect of significant topographical features and thermals carrying parts of the plume up to cloud level.

37305 **APTIC NO. 60340**

Tuna, Taskin

A SYNOPTIC-CLIMATOLOGICAL STUDY OF AIR POLLUTION POTENTIAL FOR ANKARA. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XI-1-XI-14. 5 refs. (Oct. 2-3.)*

Meteorological parameters for Ankara, Turkey are examined as part of a synoptic-climatological study of the city s air pollution potential. Light wind speed within the mixing height appears to be the most effective element in the creation of high pollutant concentrations. The following rules are formulated with respect to forecasting air pollution concentrations in the Ankara region. For pollutant concentration values around 1000 micrograms/cu m: ventilation must be less than or equal to 3000 sq m/sec without inversion or 1500 sq m/sec with inversion; surface pressure (anticyclonic circulation) must be greater than or equal to 1022 mb. For concentration values around 750 micrograms/cu m: ventilation must be less than or equal to 4000 sq/sec without inversion or less than or equal to 2000 sq m/sec with inversion; surface pressure (anticyclonic circulation) must be greater than or equal to 1020 mb. For concentration values around 500 micrograms/cu m: ventilation must be less than or equal to 5000 sq m/sec without inversion or 2500 sq m/sec with inversion; surface pressure (anticyclonic circulation) must be greater than or equal to 1020 mb.

37306 **APTIC NO. 59510**

Velds, C. A.

AIR POLLUTION EPISODES AND MATHEMATICAL MODELS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XIV-1-XIV-10. (Oct. 2-3.)*

Meteorological parameters and concentrations of sulfur dioxide were measured for the heavily industrialized Rijnmond area in an effort to study the relationship between these variables and the nuisances (eye irritation, odors) experienced by the public during an air pollution episode. More than 200 complaints were made on days with a mixing height less than 500 m and a mean wind speed less than or equal to 4.5 m/sec, a mixing height between 500-1000 m and a mean wind speed less than or equal to 2.5 m/sec, a mixing height between 1000 and 1500 m and a mean wind speed less than or equal to 2 m/sec, or a mixing height greater than 1500 m and a mean wind speed less than or equal to 1.5 m/sec. A ventilation factor of less than 3000 sq m/sec increased the chances of increase in the number of complaints. Any relationship between meteorological parameters and SO2 concentrations and the nuisances experienced appeared to be overruled by small variations in the meteorological parameters and perhaps the emissions, making the use of a mathematical model for such situations practically impossible.

37307 **APTIC NO. 60321**

Westernberg, A. A.

EFFECT OF NOX ON STRATOSPHERIC OZONE. *Johns Hopkins Univ., Silver Spring, Md., Applied Physics Lab., Navy Contract N00017-72-C-4401, Task X81Q, Rept. TG 1186, 30p., March 1972. 17 refs.*

NTIS, DDC: AD 742829

Significant chemical reactions in determining the photochemical equilibrium concentration of ozone in the dry stratosphere when oxides of nitrogen are present were examined; and the appropriate rate equations were put into compact, nondimensional form for calculating the reduction of O3 caused by NOx. Numerical solutions were obtained for a range of parameters likely to cover all cases of practical interest, and a strongly catalytic effect of NOx in reducing O3 was indicated. Specific calculations for typical atmospheric conditions showed that the inclusion of naturally present NOx at a mole fraction of about 10 to the minus 8 considerably improved the agreement between theoretical and experimental O3 profiles. Possible effects of the artificial addition of NOx (as by large-scale supersonic transport operations) were considered, and their relative importance was crucially dependent on the amount of NOx already present naturally. (Author abstract modified)

37308 **APTIC NO. 59490**

STUDY OF THE POLLUTION OF AN INDUSTRIAL SITE BY SMOKE TRACING. APPLICATION TO THE FEYZIN REFINERY (R. SARTEUR - ELF-UNION - B. P. 22 - 69-ST-SYMPHORIEN-D OZON). INTRODUCTION - NATURE OF REFINERY-GENERATED POLLUTION. *(Etude de la pollution d un site industriel par tracage des ses fumees. Application a la raffinerie de Feyzin R. Sarteur - Elf-Union - B. P. 22-69-St-Symphorien-d Ozon Introduction - nature de la pollution d une raffinerie). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 9p. (May 3-5.)*

The dispersion of the sulfur dioxide emissions from the Feyzin refinery, and the contribution by this refinery to the SO2 concentrations in Lyon were studied by the tracer technique. Sulfur hexafluoride was used as a tracer for crvogenic determination. Wind speed, wind direction at ground level, wind speed and direction at altitude, statistical distribution of wind directions, and the thermal gradient of the atmsophere were also measured in parallel with the measurement of the sulfur hexafluoride and SO2 concentrations at distances of 1 to 35 km off the source. The contribution of the refinery SO2 emissions to the SO2 concentrations in Lyon was found negligible, partly due to the thermal lift above the city. The influence of the refinery SO2 emission was highest at a distance of 2-5 km and declined to 1.5% and 0.13% at 0.8 and 8 km.

37309 **APTIC NO. 59505**

California Division of Highways, Materials and Research Dept.

AIR QUALITY MANUAL. APPENDIX: MATHEMATICAL APPROACH TO ESTIMATING HIGHWAY IMPACT ON AIR QUALITY. (FINAL REPORT). *Rept. CA-HWY-MR65082S-4-72-12, 109p., July 1972.*

Appendices to a California Division of Highways air quality manual on a mathematical approach to estimating highway impact on air quality are provided under separate cover. Graphical representations are presented for mathematical functions concerning the following: grade sections, non-parallel wind; elevated sections, non-parallel wind; cut sections, non-parallel wind; parallel wind; dispersion parameters; and emission factors.

1971

37310 **APTIC NO. 59481**

Abramov, R. V.

DUST IN THE ATMOSPHERE OVER THE ATLANTIC OCEAN. *(Pyl v atmosfere nad atlanticheskim okeane). Usloviya sedimentatsee v Atlanticheskon Okean. Izd. Nauka Moskva, 1971:7-30. Translated from Russian. Israel Program for Scientific Translations, 28p., 1972. 72 refs.*

NTIS: TT 72-50018

Sources and modes of transport of natural dust deposited over the Atlantic Ocean, mostly north of the equator, are reviewed. Participation of the atmosphere in recent sedimentation on the bottom of oceans is beyond doubt, although its role in transporting material of various origin is not clear. The active role of atmospheric processes is clear in the case of eolian deposits, and atmospheric influences are a major factor in erosion. The turbulence of atmospheric movements increases the quantity of comminuted material removed from land surfaces; air currents transport dust over large distances; and descending air currents and atmospheric precipitation, to a certain extent, facilitate dustfall over the oceans. Material such as volcanic dust is transported by the atmosphere with the possibility of appreciable alterations in the basic parameters of atmospheric circulation. The atmosphere may be regarded as a passive medium, damping the meteoric particles, in the case of cosmic dust.

37311 **APTIC NO. 60304**

Barry, P. J.

A NOTE ON PEAK-TO-MEAN CONCENTRATION RATIOS. *Boundary-Layer Meteorol., 2(1):122-126, Sept. 1971. 5 refs.*

The peak-to-mean concentration ratio obtained from observations near a point source of pollution is a particular example of the ratio of any short-period concentration to the long-term mean. The value of this ratio may be obtained from the probability distribution function: F(C) equals F(0)exp(-F(0)C/M) where F(C) is the probability or frequency that the ratio of a short-period average concentration (C) to the long-term mean (M) exceeds the value C/M, and F(0) is a parameter dependent on the length of the short period and the position of the sampler relative to the center-line of the plume. From this equation, the peak-to-mean concentration ratio can be related to the two averaging times by the expression P/M equals 1/F(0) (InF(0)-In tM/tP) where tM and tP are, respectively, the averaging times of the long-term mean M and the short-term peak P. Using recently published experimental data, the first equation and hence also the second were shown to be valid for averaging times tP from 5 sec to 24 hr and of tM from 6 min to 5 yr provided tP is less than tM. (Author abstract)

37312 **APTIC NO. 59759**

Llewelyn, M. P.

AIR POLLUTION POTENTIAL OF A RECTANGULAR CITY. *Australasian Conf. Hydraulics Fluid Mech., 4th, Proc., Melbourne, Australia, 1971, p. 554-561. 3 refs. (Nov. 29-Dec. 3.)*

Three simple mathematical models are developed for the atmospheric diffusion process over a city being swept by a constant velocity wind under conditions of limited vertical mixing. The models are used to obtain expressions for the air pollution potential; the effects of the successive refinements incorporated, and of variation of the parameters, are explored. When the air pollution potential is in excess of 40, the three models are in substantial agreement. The area source model can be brought into close agreement with volume source version, with an emission depth of 5 m, by using a constant decrement of 35 rather than 41. For normal city shapes, there is little decrease in the air pollution potential due to the finite width of the city. It is the dimension in the direction of flow that has a dominant effect, and this suggests that in compiling frequency tables of air pollution potential from recorded data, account should be taken of the direction of the wind to choose the appropriate maximum city dimension parallel to this heading. (Author summary modified)

37313 **APTIC NO. 59433**

Regener, Victor H.

ATMOSPHERIC OZONE. (FINAL REPORT). *New Mexico Univ., Albuquerque, Dept. of Physics and Astronomy, Air Force Contract F19628-69-C-0138, Proj. 8604, Task 860406, AFCRL-71-0230, 28p., April 14, 1971. 15 refs.*

NTIS: AD 725764

The flux of atmospheric ozone near the ground and further measurements of this flux by a wind tunnel placed on the ground were studied to evaluate the combined effects of the reaction rate between ozone and the surface on the one hand, and the amount of turbulent transport on the other, upon the ozone flux into the surface. The flux of atmospheric ozone into the ground is treated in terms of a rate-limited process, and it is assumed that the rate of a slow catalytic or chemical reaction of a dilute atmospheric trace gas is proportional to its concentration at the surface. Introduction of a surface resistance into the transfer equation leads to an expression which shows that the ozone flux becomes independent of turbulence for a sufficiently slow reaction rate and for a sufficiently large amount of turbulent activity. The degree of accuracy with which the ozone flux can be determined over a natural surface is calculated from a simple measurement of the reactivity of the surface by means of the box method and from a measurement of the ozone concentration at a single point above the surface. The tunnel method lends itself to a determination of the surface reaction constant for ozone under controlled conditions of air flow, and average values of 0.73 cm/sec for the Reynolds analogy case and 0.96 cm/sec for the Chamberlain mass transfer formula case were derived. The box method produced a value of 0.92 cm/sec. The agreement for the constant between tunnel and box, especially for the second case, is highly satisfactory.

37314 **APTIC NO. 59741**

Reilly, Hugh T. and Donald O. Egner

MICROSTRUCTURES AND AREA CONTAMINATION PROFILES OF AITKEN TYPE CONDENSATION NUCLEI CLOUDS FROM SMALL SOURCES. *Preprint, American Chemical Society, 6p., 1971. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971.)*

Clouds of condensation nuclei from several sources were examined by airborne detectors of Aitken type nuclei. The microstructure of the clouds as well as the contribution of small sources to the overall level of contamination downwind were determined by sampling rates of five and 10 cycles/sec with response times less than 0.3 sec. The sampling aircraft (JOV-IB and UH-TH) flew parallel flight paths 500 to 1000 m apart perpendicular to the wind working upwind through the contamination source. Altitudes from 10 to 100 m were flown to provide low level contamination profiles. The polyfurcation of plumes occur much more frequently and continues to occur further downwind than previously supposed. These data support a hypothesis that very small sources of contamination have a profound influence on background levels of an area. (Author abstract modified)

37315 **APTIC NO. 60300**

Reiter, R. and R. Sladkovic

RESULTS OF LONG-TERM VERTICAL EXCHANGE INVESTIGATIONS IN HIGH MOUNTAINS. *(Ergebnisse mehrjaehriger Austausch-Forschungen im Hochgebirge). Text in German. Ann. Meteorol., no. 5:185-192, 1971. 17 refs.*

Continuous recordings of aerosol concentration were made for an extended period of time at high mountain stations at 730 m a.s.l. (valley floor), 1780 m a.s.l. (Wank peak), and almost 3000 m a.s.l. (Zugspitze peak), as well as the cable cars equipped with sensors and telemetry systems. Both the recorded data obtained at these stations and the vertical aerosol profiles obtained with the cable car radiosondes were used for computing the vertical exchange coefficient and its dependence upon altitude. The profiles of exchange intensity thus obtained, particularly their fine structure in layers of not less than 50 m thickness, are brought in relation to the aerological data simultaneously obtained in the same area. Any interrelations -- both under stationary conditions, and during dynamic processes -- are discussed on the basis of typical profiles and statistical evaluation.

37316 **APTIC NO. 59461**

Roessler, F.

AEROSOL LAYERS IN THE ATMOSPHERE. *Deutsch-Franzoesisches Forschungsinstitut Saint-Louis and Inst. Franco-Allemand de Recherches de Saint-Louis, 18p., June 1971. 21 refs.*

NTIS: N7221373

Measurements of diffuse skylight were made with rockets and balloons near Hammaguir, Stuttgart, and Kiruna to determine the dust concentration in the atmosphere. The instrument and its calibration are discussed. Radiation at any altitude is determined by the differentiation of the curve of the monotonously decreasing light intensity. The resulting curve shows the existence of layers caused by light scattering of aerosols. The effect is intensified when the light is referred to the unit of mass instead of volume of the air. In this case the decrease of the air density with altitude is eliminated. Such processing makes layers clearly discernible at 25, 50, and 82 km, the exact altitude depending on the geographical latitude. The layer at 82 km is connected with the appearance of noctilucent clouds. By taking into account the factors of turbidity of these layers and correlating them with the dependence on angle and wavelength, the resulting distribution of sizes can be determined to contain a great amount of Aitken particles to reach agreement between experiment and calculation. With such a distribution, the number of particles and their weight is calculated.

1970

37317 **APTIC NO. 59520**

Holland, A. C. and G. Gagne

THE SCATTERING OF POLARIZED LIGHT BY POLYDISPERSE SYSTEMS OF IRREGULAR PARTICLES. *Appl. Opt., 9(5):1113-1121, May 1970. 12 refs.*

The elements of the Mueller matrix for polydisperse systems of irregular, randomly oriented particles were measured in absolute terms as a function of the scattering angle for two wavelengths. Calibration of the polar nephelometer system is discussed. The results were compared to the matrix elements that were calculated for assemblies of spherical particles that fit the same particle size distribution function and have the same real refractive index. Particle dispersion and characteristics, signal processing, and data reduction are discussed. The unpolarized mass scattering coefficient for a polydisperse system of irregular but randomly oriented particles show a remarkable similarity to the corresponding coefficient for spherical particles, but predicting backscattering for such particles on the basis of the spherical model can lead to serious errors. The particle dispersion system used in these experiments generates a scattering medium whose matrix exhibits the properties of an isotropic symmetric medium. (Author abstract modified)

37318 **APTIC NO. 59900**

Yamamoto, G., A. Shimanuki, and S. Nishinomiya

DIFFUSION OF FALLING PARTICLES IN DIABATIC ATMOSPHERES. *J. Meteorol. Soc. (Japan), 48(5):417-424, Oct. 1970. 8 refs.*

The diffusion of particles having an equal fall velocity which are released from a cross-wind line source in diabatic atmospheres was studied numerically. The solution of the resulting diffusion equation is obtained for various combinations of the source height, thermal stability, and terminal velocity of the particles. In addition, the deposition rate of particles on the ground is estimated as a function of the downwind distance, source height, and stability. Diffusion of particles having different sizes is then estimated. The vertical distribution of the concentration, the rate of deposition of smoke particles, and the diffusion of smoke particles of different sizes are presented in figures. (Author abstract modified)

37319 **APTIC NO. 59933**

Young, James A., Ned A. Wogman, Charles W. Thomas, and Richard W. Perkins

SHORT LIVED COSMIC RAY-PRODUCED RADIONUCLIDES AS TRACERS OF ATMOSPHERIC PROCESSES. *In: Radionuclides in the Environment, Gould (ed.), Washington, D. C., American Chemical Society, 1970, Chapt. 28, p. 506-521. 7 refs.*

Radionuclides are produced in the atmosphere by cosmic rays at a relatively constant rate. The atmospheric disintegration rates of the cosmogenic radionuclides beryllium(7) (53 days) and sodium(24) (15 hours) were measured in field studies at 46 deg N from ground level to 63,000 ft. The activity of Be(7) changed with time due to atmospheric motions and deposition at the earth s surface; however, the shorter-lived radionuclide Na(24) remained nearly at equilibrium with its production rate. The disintegration rates of the cosmogenic radionuclides chlorine(39) (55 minutes), Cl(38) (37 minutes), and Be(7) (53 days) in rainwater are also reported, and their use in studying the efficiencies and time scales of the precipitation scavenging of atmospheric aerosols is discussed. (Author abstract)

1967

37320 **APTIC NO. 59941**

Ingram, W. T. and F. P. Francia

METEOROLOGY. *In: Quad-City Solid Wastes Project. An Interim Report. June 1, 1966 to May 31, 1967. Dept. of Health, Education, and Welfare, Public Health Service, p. 3-1 to 3-13, 1967.*

The meteorology and topographic interactions of the Quad-City area is described. The area is dominated by valley-slope circulations. In times of strong pressure gradients, local winds are influenced by down wash in the lee of the mountain ridges with strong geostrophic level crosswinds and by preferred wind direction frequencies which coincide with the valley-slope orientation. During periods of weak pressure gradients, valley-slope circulations develop, and each location can exhibit its own microclimate. Field observations were conducted in October, November, and January, and spot checks were made of the area. Smoke and haze layers and various stack plumes were observed. Days of poor visibility and distinct odors of burning garbage or wet paper occurred. A stagnant high pressure system and a low level subsidence inversion caused an air pollution incident during the observations. Since the proposed solid waste project would produce stack emissions from the valley which would diffuse over the area due to winds and other meteorological factors, these proposed emissions must be studied very carefully with regard to possible inversions and other situations which are not uncommon in the area.

BASIC SCIENCE AND TECHNOLOGY

1974

37321 **APTIC NO. 60257**

Brimblecombe, P. and D. J. Spedding

THE REACTION ORDER OF THE METAL ION CATALYSED OXIDATION OF SULPHUR DIOXIDE IN AQUEOUS SOLUTION. *Chemosphere, 3(1):29-32, Feb. 1974. 10 refs.*

A reacion scheme for sulfur(IV) oxidation based upon a chain reaction sequence is proposed as a result of studies investigating the effect of pH change on the order of the oxidation reaction at low concentrations (.00001 M) of S(IV) in 0.1 M ammonium sulfate solution in the presence of 10 to the minus 6 M Iron(III). Low concentrations were chosen to simulate the concentrations that might be expected in the aqueous atmospheric aerosol. The order of reaction, as determined from initial rates, varied from first order below pH 4 to almost second order at pH 5. Implications from the proposed scheme suggest caution in gross calculations of atmospheric sulfur dioxide oxidation in droplets; the rate of oxidation is likely to be greatly affected by the concentration of SO2 in the droplets which is likely to vary markedly from one droplet to the next. Further, the pH of an individual droplet may also affect the rate of SO2 oxidation as will the particular metal ions that may be acting as catalysts in the droplet.

37322 **APTIC NO. 59305**

Clarke, Peter L. and James L. Wardell

GROUP IVB ORGANOMETALLIC SULPHIDES. PART V. REACTIONS OF LEAD SULPHIDES WITH SOME ELECTROPHILIC SPECIES AND MERCURY COMPOUNDS. COMPARISON OF THE REACTIONS OF ARYL TRIORGANOLEAD SULPHIDES WITH THOSE OF THE OTHER GROUP IVB SULPHIDES. *J. Chem. Soc., no. 2:190-194, 1974. 27 refs.*

The reactions of aryl triphenyl lead sulfides, Ph3PbSAr, with halogens, sulfur (II) halides, carbon halides, and mercury halides are reported. Unlike the analogous tin and germanium reactions, the reactions of organolead sulfides do not lead exclusively to cleavage of the metal-S bond. Ease of cleavage of the phenyl-Pb bond, decomposition of organolead (IV) compounds to inorganic lead (II) species, and photochemical reaction with solvents, such as carbon tetrachloride, all make the organolead sulfide reactions particularly complex. Similarities and differences in the reactions of R3MSAr compounds, where R is not H, Me is C. Si, Ge, Sn, and Pb are mentioned. Some bis (arylthio) Pb reactions are also reported. (Author abstract)

37323 **APTIC NO. 60027**

Crooke, P. S. and R. A. Walsh

THE FLOW OF A DUSTY GAS THROUGH AN INFINITELY LONG PIPE. *Powder Technol. (Amsterdam), 9(2/3):111-119, Feb.-March 1974. 8 refs.*

A method for the construction of solutions for the flow of a viscous, incompressible gas with suspended dust particles when the flow domain possess special geometry is presented. Several boundary value problems arising from Saffman's formulation of the equations of two-dimensional flow for dusty gases are described. A set of linear partial differential equations representing two-dimensional flow are derived, and solutions to these equations are obtained for rectangular and circular geometries. Both steady-state and transient cases are examined. The general solution for two-dimensional flow through arbitrary cross sections in terms of eigenfunction expansions for the geometry of these cross sections are presented. Estimates are made of the average velocities in terms of readily computable parameters. (Author summary modified)

37324 **APTIC NO. 59316**

Dayan, Nissim and Isiah Gallily

A METHOD FOR THE PRODUCTION AND DETERMINATION OF THE CHARACTERISTICS OF WATER DROPLET AEROSOLS IN THE ABOVE-MICRON RANGE. *J. Appl. Meteorol., 13(1):78-86, Feb. 1974. 11 refs.*

A generator of water aerosols that produces almost uniform droplets in the above-micron range is described. The operational behavior and the effect of various parameters of the apparatus is reported. Attention is also paid to the rarely discussed electric charges of the particles, which can be neutralized at will. The size distribution of the droplets is determined both by a rate of fall and a light attenuation/weight method that check reasonably well; the number concentration is derived from the size distribution and the weight of the particles per unit volume while the charge is found from the mobility in a horizontal electric field. (Author abstract)

37325 **APTIC NO. 59307**

Deardorff, J. W.

DIFFERENCES BETWEEN EDDY COEFFICIENTS FOR INSTANTANEOUS AND CONTINUOUS VERTICAL DIFFUSION INTO THE NEUTRAL SURFACE LAYER. *Boundary-layer Meteorol., 5(4):451-457, Jan. 1974. 12 refs.*

Differences between eddy coefficents for instantaneous and continuous vertical diffusion into the neutral surface layer are calculated. Batchelor's similarity of law for vertical diffusion into the neutral surface layer was shown by Ellison to yield a universal constant equal to the Karman constant. However, the argument assumes that the eddy coefficient for mass above an instantaneous ground source is the same as for a continuous source. In this study, the former eddy coefficient is found to be time dependent and height independent if the particulate distribution is Gaussian. This leads to a value of the universal constant 2/pi smaller than found by Ellison. (Author abstract modified)

37326 **APTIC NO. 59396**

Forosinho, S. J. and A. C. Cardoso

PHOTOCHEMICAL ASPECTS OF AIR POLLUTION IN EUROPE. *Experientia Suppl., no. 20:61-70, 1974. 39 refs.*

Theories of photochemical smog are reviewed, and a new hypothesis for the rapid oxidation of nitric oxide to nitrogen dioxide is proposed. The electronic excited singlet oxygen state appears capable of playing an important role in the oxidation of NO to NO2, while energy transfer mechanisms of aromatic hydrocarbons seem important in the production of excited singlet oxygen from oxygen. The singlet oxygen may be the primary oxidant species in the photochemical smog, oxidizing relatively rapidly other organic and inorganic compounds. Since the direct photoexcitation of oxygen to singlet oxygen is a very inefficient process, once there is some sensitizer which can absorb light at wavelengths longer than 290 nm, the necessary conditions and ingredients to initiate photochemical smog exist even in the absence of nitrogen oxides. The importance of aromatic compounds in this process depends on their concentration in any particular area.

37327 **APTIC NO. 59771**

Garvin, David and R. F. Hampson (eds.)

CHEMICAL KINETICS DATA SURVEY. VII. TABLES OF RATE AND PHOTOCHEMICAL DATA FOR MODELLING OF THE STRATOSPHERE (REVISED). *National Bureau of Standards, Washington, D. C., Physical Chemistry Div., Rept. NBSIR 74-430, 104p., Jan. 1974. 335 refs.*

Chemical kinetic and photochemical data for gas phase reactions pertinent to the chemistry of the stratosphere are presented in four tables. The tables cite the reaction and reference, the temperature range, the reaction rate constant, and reliability information. Areas covered include: chemical reactions and photochemistry of neutral species, energy transfer reactions, high temperature air reactions, and ion-molecule reactions. (Author abstract modified)

37328 **APTIC NO. 60225**

Hecht, Thomas A., John H. Seinfeld, and Marcia C. Dodge

FURTHER DEVELOPMENT OF GENERALIZED KINETIC MECHANISM FOR PHOTOCHEMICAL SMOG. *Environ. Sci. Technol., 8(4):327-339, April 1974. 31 refs.*

A generalized kinetic mechanism for photochemical smog was formulated and tested. The mechanism was designed to be applicable to a large number of hydrocarbons and, ultimately, the entire atmospheric mix by taking advantage of the common features of hydrocarbon and free radical reactions to maintain at a minimum the number of species included while retaining a high degree of detail, especially concerning the chemistry of inorganic species. The kinetic scheme was tested by using n-butane-nitrogen oxides, propylene-NOx, and n-butane-propylene- NOx smog chamber data at 13 different sets of initial reactant concentrations and a wide variety of hydrocarbon to NOx ratios. The predicted effect of initial reactant ratios on ozone formation was in agreement with the data that were analyzed. (Author abstract modified)

37329 **APTIC NO. 60244**

Hedgpeth, H., S. Siegel, T. Stewart, and H. S. Judeikis

CYLINDRICAL FLOW REACTOR FOR THE STUDY OF HETEROGENEOUS REACTIONS OF POSSIBLE IMPORTANCE IN POLLUTED ATMOSPHERES. *Rev. Sci. Instr., 45(3):344-347, March 1974. 7 refs.*

The construction of a cylinder flow reactor for studying heterogeneous reactions is described with particular reference to reactions involving nitrogen oxides. The system incorporates various methods of gas analysis such as optical absorption for nitrogen dioxide, chemiluminescence for nitric oxide or ozone, gas chromatography for nitrogen or oxygen, and mass spectrometry for sulfur dioxide and other gases. The system was constructed so that experimental conditions could be varied over a large pressure range from 1 to 700 torr with a relative humidity variation of 0-90%. The system performance was evaluated by studying the thermal oxidation of NO. For volumetric flowrates of 1.5-15 cu cm/sec, input oxygen concentrations around 100 torr, and input nitric oxide concentrations around 0.3-0.7 torr, the rate constants for the reaction 2NO + O2 yields 2 NO2 were about 8-10 times 10 to the 3rd power sq l/sq mol/sec. There was a minor problem of some turbulence within the reactor. The system was also evaluated for its sensitivity in determining the efficiency of heterogeneous gas wall reactions. The system was sensitive over a range of 10 to the 8th power less than the fraction of gas wall collisions which lead to reaction less than 10 to the -4th power, depending on particular experimental conditions. (Author abstract modified)

37330 **APTIC NO. 59388**

Kuriyan, J. G. and Z. Sekera

SCATTERING IN LIQUID HAZE-ANALYTIC APPROXIMATIONS. *Quart. J. Roy. Meteorol. Soc. London, 100(432):67-75, Jan. 1974. 17 refs.*

An analytic formula is derived which describes approximately the scattering of electromagnetic waves in a haze. This formula is compared, and found to agree well, with the exact results from Mie Theory that is available in the literature. The formula is used to arrive at a simple, non-redundant but complete parameterization of the aerosol model. Scattering properties of aerosols are studied to examine atmospheric turbidity.

37331 **APTIC NO. 60258**

Liu, Benjamin Y. H. and Timothy A. Ilori

AEROSOL DEPOSITION IN TURBULENT PIPE FLOW. *Environ. Sci. Technol., 8(4):351-356, April 1974. 25 refs.*

A model is proposed for calculating the effective particle diffusivity, epsilon p, in the boundary layer of a turbulent fluid; it is based on the analogy between the diffusion of particles caused by Brownian motion and that caused by fluid turbulence. The model results in epsilon p being equal to epsilon plus v squared times tau, where epsilon is the eddy diffusivity, v is the root-mean-square fluctuating velocity of the fluid in a direction normal to the wall, and tau is the particle relaxation time. Results are presented demonstrating that the particle deposition rate based on this effective particle diffusivity and diffusion free flight model is in general agreement with experimental data without the need to use either unreasonably high or arbitrary free-flight velocities as in previous theories in which particle and eddy momentum diffusivities are assumed equal. (Author abstract modified)

37332 **APTIC NO. 59334**

MacKinnon, D. J.

NITRIC OXIDE FORMATION AT HIGH TEMPERATURES. *J. Air Pollution Control Assoc., 24(3):237-239, March 1974. 4 refs.*

The amount of nitric oxide formed from various mixtures of nitrogen and oxygen has been measured by means of MS-10 mass spectrometer as a function of the temperature, residence time at temperature, percent N2 and percent O2 of gas mixtures. There is a peak temperature for NO formation and near this temperature NO formation reaches a maximum at a residence time of 5 sec. The formation of NO is directly dependent on percent N2 to the first power and on percent O2 to the one-half power. (Author abstract)

37333 **APTIC NO. 60261**

McClenny, William A.

DETERMINATION OF RELATIVE RATES FOR OXYGEN ATOM-HYDROCARBON REACTIONS BY REDUCTION OF OXYGEN ATOM, NITRIC OXIDE CHEMILUMINESCENCE. *J. Chem. Phys., 60(3):793-795, Feb. 1, 1974. 10 refs.*

Relative rates of reaction between oxygen atoms and olefinic hydrocarbons were determined at 25 C, + or 5 C. The relative rates with reference to isobutene for ethylene, propylene, 1-butene, cis-2-butene, trans-2-butene, 1.3-butadiene, and and 3-methylbutene-1 were: 0.042, 0.20, 0.18, 0.79, 1.25, 0.96, and 0.22 plus or minus respectively 0.010, 0.05, 0.07, 0.25, 0.35, 0.35, and 0.05. Hydrocarbons and oxygen atoms were mixed prior to detection of the oxygen atoms by their chemiluminescent reaction with nitric oxide. The chemiluminescent signal was simply related to the product of the gas phase contact time, the hydrocarbon concentration, and the reaction rate constant for the oxygen atom hydrocarbon reaction. Olefinic hydrocarbon concentrations as low as 1.0 ppm were used to establish the relative rates with an oxygen atom concentration of approximately 10 to the 7/cc at a system pressure of 10 torr. (Author abstract modified)

37334 **APTIC NO. 60238**

Ranade, M. B., D. T. Wasan, and R. Davies

COAGULATION OF LEAD CHLORIDE AEROSOL IN THE PRESENCE OF WATER VAPOR. *Am. Inst. Chem. Engrs. J., 20(2):273-279, March 1974. 4 refs.*

Polydisperse submicronic lead chloride aerosols which are present in automobile exhausts were generated from melt phase under dry and humid conditions in an effort to study the effects of temperature and humidity on particle growth. Particle size and concentration increased with increasing generation temperature. The aerosol particles generated in a dry atmosphere were spherical, while those generated under humid conditions showed development of crystallinity at the surface. Coagulation rates measured at room temperature under different humidities were in good agreement with Smoluchowski s theory, modified to include the effect of polydispersity; the rates were unaffected by humidity. Interaction of PbCl particles with water vapor was characterized by adsorption at the interface. The coagulated aerosol exhibited a chain structure for humidities lower than 70%, while at higher humidities compact agglomeration was observed. (Author abstract modified)

37335 **APTIC NO. 59321**

Strickler, S. J., John P. Vikesland, and H. D. Bier

THREE(B)ONE-ONE(A)ONE TRANSITION OF SO2 GAS. II. RADIATIVE LIFETIME AND RADIATIONLESS PROCESSES. *J. Chem. Phys., 60(2):664-667, Jan. 15, 1974. 16 refs.*

A modification of the equation given by Strickler and Berg is derived for calculating from spectroscopic data the radiative lifetime of a molecule whose transition moment varies with configuration. Using this equation, the radiative rate constant of the 3B1 state of sulfur dioxide is calculated to 79 + or 5/sec. The decay rate of this state is reported as a function of pressure at 30 C. The rate constant for quenching by ground state SO2 is 4.52 + or 0.18 times 10 to the 8th l/mole sec. The decay rate extrapolated to zero pressure is 1.12 + or 0.20 times 1000/sec. Comparison with the radiative rate constant shows that only about 7% of the triplet molecules emit, and the rest undergo some pressure independent nonradiative process. (Author abstract)

37336 **APTIC NO. 59985**

Takahashi, Satoru and Kiyoshi Ueda

FULL-AUTOMATIC ENGINE-PERFORMANCE MEASURING SYSTEM. *(Zenjido doryoku seino sokutei sochi ni tsuite). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(3):189-194, March 1974.*

A computerized on-line system designed to permit simultaneous operation of two or more dynamometers and automatically printout tables and diagrams of the test results is described. A cathode ray tube (CRT) display hardcopy system allows the testors to monitor the test. The exhaust gas analysis process is fully automated. The engine performance test performed by this system consists of the normal performance test, the running resistance test, the constant air/fuel test (Mode A) and the constant air/fuel test (Mode B). An alarm device indicates any abnormal functioning of the system.

37337 **APTIC NO. 60284**

Watkins, David A. M.

SOME IMPLICATIONS OF THE PHOTOCHEMICAL DECOMPOSITION OF PESTICIDES. *Chem. Ind. (London), no. 5:185-190, March 2, 1974. 46 refs.*

The photochemical decomposition of various pesticides (dieldrin, heptachlor, DDT, carbamates, acids, dichlofluanid, dinitrophenols, dithiocarbamates, and systemic fungicides) is reviewed in terms of decomposition products and mechanism of breakdown. Dieldrin is an example of a pesticide which has been known for years to undergo changes in sunlight; photoproducts with increased activity have been found as residues in plants or animals material. Thin films of solid on glass plates irradiated with sunlight or 253.7 nm light give a bridge isomer, whereas in solution a chlorinated compound of different structure is formed; both compounds undergo further photoreaction in solid films. The photolysis of heptachlor follows a similar pattern, a cage molecule being formed in acetone solution with light of 300 nm. Photochemical breakdown of DDT gives the more volatile DDE. Little has been reported on the photochemical behavior of the newer systemic fungicides thus far.

37338 **APTIC NO. 60341**

Whitacre, G. R., R. A. McCann, and A. A. Putnam

THERMAL RADIATION MODELING FOR POLLUTION PREDICTIONS. (FINAL REPORT). *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Grant R-800842, Program Element 1ABO14, ROAP 21ADG-16, EPA-650/2-74-011, 65p., Feb. 1974. 18 refs.*

NTIS: PB 229666/AS

The mathemtical modeling of the combustion process was investigated. Adequate treatment of thermal radiation is essential and accurate temperatures are especially important for pollution predictions since the chemical kinetics are extremely temperature dependent. Test cases are described which combined the Hottel Zone Method with a completely analytical flow and mixing solution. The complexities that arise when this approach is extended to real systems seem to eliminate it as a working tool. The results were used to check the accuracy of several four-flux radiation approximations which are simpler than the Zone Method. Tests of an alternate approximate method are described which offers great promise: an expansion of the radiation transport equation by spherical harmonics. When the first three terms of the associated Legendre polynomial series are retained, a single second order differential equation results. This equation applies over the entire field in contrast to the four-flux approaches which use separate equations for each direction. (Author abstract modified)

37339 **APTIC NO. 59817**

Zaugol nikov, S. D., M. M. Kocsanov, A. O. Loyt, and I. I. Stavchanskiy

NOMOGRAMS FOR ESTABLISHING APPROXIMATE MAXIMUM PERMISSIBLE CONCENTRATIONS OF NOXIOUS SUBSTANCES. *(Nomogrammy dlya ustanovleniya orientirovochnykh predel no dopustimykh kontsentratsiy vrednykh veshchestv). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 1:28-30, 1974. 9 refs.*

Nomograms calculated by linear regression analysis with respect to the maximum allowable concentration of noxious substances and their acute toxicity parameters (LD50, LC50) are proposed for the approximate calculation of maximum allowable concentrations of such substances in open air, work place air, and in water. Close correlations between LC50, LD50, and the maximum allowable concentration were established. The maximum allowable work place concentrations of alkyl alcohol, acetone, benzene, dimethylamine, xylene, toluene, and ethyl ether were calculated to be 1.3; 63; 40; 4; 25; 63, and 126 mg/cu m, against the corresponding, experimentally determined maximum allowable concentrations of 2; 200; 5; 1; 50; 50, and 300 mg/cu m.

37340 **APTIC NO. 60296**

Center for Industrial Information

GUIDE TO INFORMATION SOURCES ON ENVIRONMENTAL SCIENCE AND TECHNOLOGY. *Antwerp, Flemish Economic Association, 1974, 250p.*

This reference book provides access to information sources for international literature on all scientific and technological aspects of environmental pollution. Primary information sources listed include books, periodicals (comprising journals, newsletters, and series), technical reports, conference proceedings, dissertations, patents, standards, and specifications. Secondary information sources cover reference volumes (including handbooks, manuals, specialized encyclopedias, dictionaries, atlases, directories, guides, and yearbooks), individual bibliographies, information surveys, and current secondary sources (such as current bibliographies, current awareness services, and indexes and abstracts). The guide is fully indexed by author, title, and organization, and each entry is annotated.

1973

37341 **APTIC NO. 59747**

Anasoulis, R. F. and H. McDonald

A STUDY OF COMBUSTOR FLOW COMPUTATIONS AND COMPARISON WITH EXPERIMENT (FINAL REPORT). *United Aircraft Research Labs., East Hartford, Conn., Environmental Protection Agency Contract 68-02-0267, Program Element 1ABO14, ROAP 21ADG-10, EPA-650/2- 73-045, 97p., Dec. 1973. 48 refs.*

NTIS: PB 230008/AS

A computational procedure for calculating the coupled flow and chemistry within combustion devices is presented. The procedure solves the time averaged Navier-Stokes equations with coupled chemistry, including the effects of turbulence and radiative heat transfer, using a novel field relaxation method. Although a relatively simple turbulence model is employed in the procedure, modification to this model is easily implemented within the framework of the computational method. Computations of the flow and chemistry within a representative furnace have been made using the procedure and are presented and compared with experimental data. (Author abstract modified)

37342 **APTIC NO. 59770**

Ferriss, D. H.

ON THE NUMERICAL DETERMINATION OF PARTICLE SIZE DISTRIBUTION IN A COAGULATING AEROSOL. *National Physical Lab., Div. of Numerical Analysis and Computing, Rept. NAC 35, 17p., May 1973. 3 refs.*

NTIS: N73-31373

The application of a simple predictor-corrector technique to a computer program for the numerical solution of a non-linear integro-differential equation representing a mathematical model of a coagulating aerosol is presented. The problem is stated mathematically, and numerical methods are illustrated for its solution. Details of the program and the solution of a test case are also included.

37343 **APTIC NO. 59554**

Goryushko, V. Ye., N. G. Vilesov, S. L. Zal tsman, N. N. Levchuk, V. M. Rasputko, V. N. Maltsev, and B. I. Kolesnikov

STUDY OF THE SULFUR DIOXIDE REDUCTION PROCESS WITH METHANE TO CARBON DISULFIDE BY THE EXPERIMENT PLANNING METHOD. *(Issledovaniye protsessa vosstanovleniya sernistogo angidrida metanom do serougleroda a primeneniyem planirovaniya eksperimenta). Text in Russian. Khim. Tekhnol., no. 1:12-16, 1973. 4 refs.*

The process of the sulfur dioxide reduction with methane to carbon disulfide was studied under different experimental conditions, using the experiment planning method. Lead orthophosphate on fireclay was used as catalyst, and the methane-sulfur ratio, the catalytic temperature, and the space velocity were in the reaspective ranges of 1.1-1.7, 780-820 C, and 150-200/hr. The rate of carbon disulfide formation increased with reducing methane-SO2 ratio with temperature increasing to 820 C, and reducing space velocity. The Cs2 output was highest at a contact time of 9.28 sec. Under high load conditions, the Cs2 output increased with the methane-sulfur ratio, while under low load conditions, the CS2 output decreased with the increasing methane sulfur ratio.

37344 **APTIC NO. 60328**

Hampson, R.

PHOTOCHEMISTRY OF NHO2. *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 7-8, Aug. 1973. 4 refs.*

Chemical kinetic data are reviewed for the photochemistry of nitrous acid (HNO2) vapor. Primary photochemical transitions are considered in relation to activation energy, reaction enthalpy, and wavelength threshold. The absorption spectrum of HNO2 vapor in the region 300-400 nm consists of a series of diffuse absorption bands which show no fine structure when photographed on a 20 ft grating spectropgraph with a resolving power of 150.000. Neither absorption coefficients nor quantum yields have been published, and the only related data on the former are for HNO2 in an aqueous solution.

37345 **APTIC NO. 60332**

Hampson, R.

N2O5 PHOTOCHEMISTRY. *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 93-97, Aug. 1973. 7 refs.*

A kinetic data survey of the photochemical reaction of nitric anhydride with ultraviolet light is presented. Data are given for the absorption spectrum, absorption coefficient, and quantum yields. A mechanism is proposed for the photochemistry of pure N2O5, where the limiting low pressure primary quantum yield for the production of oxygen atoms is one-half the value of Phi (-N2O5) obtained in the absence of inert gas, i.e., 0.31.

37346 **APTIC NO. 59731**

Happel, John and Miguel A. Hnatow

CATALYTIC OXIDATION OF SULFUR DIOXIDE USING ISOTOPIC TRACERS. *New York Univ., New York, School of Engineering and Science, Environmental Protection Agency Grant R801321, Program Element 1A2013, EPA-650/2-73-020, 36p., Aug. 1973. 8 refs.*

NTIS: PB 224305/AS

The oxidation of sulfur dioxide over a commercial vanadium pentoxide catalyst was investigated using an all glass, essentially gradientless, reactor at 470-480 C and at concentrations up to several percent of SO2. A theoretical development was derived for the use of isotopic tracers to study the kinetics and mechanism of complex catalytic reactions. Relationships developed on the basis of steady state conditions are combined with principles of thermodynamics and transition state theory. Data were obtained using radioactive sulfur 35 and the stable isotope oxygen 18 as tracers. The employment of two tracers simultaneously and the employment of more than one level of marking while still maintaining a fixed overall reaction velocity were often advantageous. Oxygen chemisorption is thy most important mechanistic step in SO2 oxidation. As equilibrium is approached, desorption of sulfur trioxide also assumes considerable importance. These findings led to the formulation of an improved rate equation, especially accurate near equilibrium, for SO2 conversion. The use of S(35) in developing improved catalysts is recommended. (Author abstract modified)

37347 **APTIC NO. 60182**

Hayashi, K. and Y. Murakami

REACTION OF NH3 AN NO OVER VARIOUS METAL OXIDES. *(Kakushu kiazoku sankabutsu niyoru NH3 to NO no hanno). Text in Japanese. Preprint Japan Chemical Society, Tokyo, p. 134-135, 1973. 2 refs. (Presented at the Symposium on Catalysis, 33rd, Hiroshima, Japan, Oct. 10-11, 1973.)*

Reduction of nitric oxide by ammonia was studied over various metal oxide catalysts. Activity and selectivity of these catalysts were compared and the reaction mechanism is discussed. Cupric oxide, Fe2O3, and V2O5 were the most active catalysts followed by Cr2O3, MoO3, WO3, ZnO, Co3O4, SnO2, TiO2 and NiO. Cupric oxide, Fe2O3 and Cr2O3 (P-type semiconductors) increased N2 selectivity with an increasing reaction temperature, while V2O5 and WO3(n-type) showed 100% selectivity at low temperatures, decreasing selectivity at higher temperatures. A plot of apparent activation energies versus standard heat of formation for these oxides yielded two distinct straight lines, one for Fe2O3, Cr2O3, and MoO3 and the other for WO3, V2O5 and SnO2. P-type semiconducting catalysts adsorbed NO, while the n-type adsorbed either NH3 or dissociated H2 and that the rate-determining step was dissociative adsorption of NH3 to produce adsorbed NH2 and H2 over p-type catalysts while adsorption of NO was the rate-determining step for n-type catalysts. A possible scheme of NH3-NO reaction for these two types of catalysts was presented.

37348 **APTIC NO. 59822**

Hiraoka, Masakatsu, Arimitsu Ikeda, and Toshihiro Kitada

PHOTOCHEMICAL SMOG REACTIONS SYSTEMS. *(Taiki osen kokagaku hanno moderu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):564, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 287.)*

Using 16 reaction formulas that were developed and presented in a previous report, various factors affecting the initial reaction speeds of photochemical pollutants were examined. The factors studied here are light radiation quantity, the initial concentration ratio of hydrocarbons and nitric oxide, and the initial concentration of nitrogen dioxide. Constants were used for free radicals and parameters were fixed at certain values. The increase of radiation quantity causes a reaction speed increase and the maximum ozone quantity. Within the range of concentration ratios 2.8-3.8 for HC and NO, the greater the ratio, the formation of the maximum NO2 is faster, and the values of both NO2 and O3 are high. When HC is 0 ppm, there is almost no change to the NO and NO2 level even with light radiations.

37349 **APTIC NO. 60330**

Huie, R. E. and J. T. Herron

CHEMICAL KINETICS DATA SURVEY. THE BIMOLECULAR REACTION BETWEEN NO2 AND O(3P). *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 79-84, Aug. 1973. 17 refs.*

A kinetics data survey of experimental systems involving the bimolecular reaction between nitrogen dioxide and O(3P) is presented. Reaction rate data are provided for flash photolysis systems at various temperatures and pressures, and a theoretical calculation of activation energy amounting to 12.5 kJ/mol is predicted via the bond energy-bond order method.

37350 **APTIC NO. 60331**

Huie, R. E. and J. T. Herron

CHEMICAL KINETICS DATA SURVEY. THE TERMOLECULAR ASSOCIATION OF NO2 AND O(3P). *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 85-92, Aug. 1973. 11 refs.*

A kinetics data survey of experimental systems involving the termolecular association of nitrogen dioxide and O(3P) is presented. Data are provided for reaction rate measurements of the above in competition with the bimolecular reaction between NO2 and atomic oxygen leading to nitric oxide and oxygen for the steady ultraviolet photolysis of NO2 at room temperature. Relative rate constants were derived from experimental quantum yields using a mechanism for the photolysis of NO2 and assuming steady state values for O, nitrogen trioxide, and ozone.

37351 **APTIC NO. 60232**

Kato, K., K. Mori, C. Kurata, and K. Fujii

FORMATION OF FUEL NO AND ITS REDUCTION. *(Fuel NOx no seisei to sono teigenho nitsuite). Text in Japanese. Preprint, Combustion Inst. (Japan), p. 123-126, 1973. 8 refs. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 34.)*

Analysis of fuel nitric oxide formation was examined in terms of elementary reaction rate theory. Assuming that all nitrogen contained in fuel become nitrogen atoms, the conversion of these nitrogen atoms to NO was computed and further problems were pointed out. Using the extended Zeldovich mechanism, a rate equation was developed for the formation of NO. The conversion ratios were obtained by solving the equation for various air-to-fuel ratios, fuel N contents and temperatures. The computed coversion ratios qualitatively agreed with the experimental result. Considering the non-equilibrium nature of chemical species in a flame, the concentration of the chemical species and temperature variations were computed as a function of time. The concentration of oxygen rapidly decreased within the flame region and approached the equilibrium value. On the other hand, hydroxides, O, and H are rapidly formed in the flame and N immediately formed NO. The conversion ratio was largely influenced by the time of emission of N atoms. When fuel N becomes N atoms, the N atoms immediately produce NO or N2 and the amount of fuel NO formation can be approximately calculated when O2 and OH concentrations are known.

37352 **APTIC NO. 60329**

Kurylo, M. J.

CHEMICAL KINETICS DATA SURVEY. THE REACTION OF HO WITH H2O2. *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 9-14, Aug. 1973. 14 refs.*

Reaction rate data for the reaction of hydroxyl radical (OH) with hydrogen peroxide and relative to the reactions: carbon monoxide plus OH yields carbon dioxide and hydrogen atom; OH plus hydrogen going to hydrogen atom and water are reviewed. The reaction of OH and hydrogen peroxide to give water and hydrogen dioxide (HO2) is a simple H atom abstraction and is the only interaction expected in the system. Flash photolysis data are subject to some uncertainty due to the method of temperature measurement. This coupled with the normal experimental uncertainties gives a reliability factor of approximately two to the data.

37353 **APTIC NO. 60333**

Laufer, A. H.

CHEMICAL KINETICS DATA SURVEY. PHOTOLYSIS OF O2. *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 98-108, Aug. 1973. 19 refs.*

A kinetics data survey for the photolysis of oxygen is presented. Primary photochemical transitions are reviewed in terms of activation energies, reaction enthalpies, and wavelength thresholds; and absorption coefficient data are provided for several systems outlined. The need for quantum yields for the production of oxygen atoms in specific electronic states is underlined.

37354 **APTIC NO. 59304**

Lifshitz, C. and R. Tassa

A STUDY OF THE REACTION O(-) + NO2 YIELDS O + NO2(-) IN A PULSED ION SOURCE. *Int. J. Mass Spectrom. Ion Phys., 12(3): 433-437, Dec. 1973. 12 refs.*

The charge transfer from oxygen(-) to nitrogen dioxide was studied in a pulsed ion source. The rate constant obtained for this reaction, k equals (1.25 + or 0.1) times 10 to the -9th power cu cm/molecule/sec, is in excellent agreement with previous results by the flowing afterglow method. (Author abstract)

37355 **APTIC NO. 59751**

Lipeles, M., C. S. Burton, H. H. Wang, E. P. Parry, and G. M. Hidy

MECHANISMS OF FORMATION AND COMPOSITION OF PHOTOCHEMICAL AEROSOLS. *Rockwell International, Thousand Oaks, Calif., Science Center, Air Pollution Research Advisory Committee Contract 68-02-0562, Program Element 1A1008, Environmental Protection Agency-R3-73- 036, SC537.10FR, 103p., July 1973. 60 refs.*

A feasibility study of a flow reactor concept for the study of the mechanism of formation and composition of photochemical aerosols was conducted. The technique involves a fast flow reactor which may be operated in a wall-free mode. Aerosols were produced in this reactor from a light-irradiated gas mixture included nitrogen dioxide, 1-hexene, sulfur dioxide, water, and air. The chemical composition of these aerosols was analyzed. These analyses included sulfate which was definitely present, nitrate which was detected, but may have been a contamination problem in the collection method, and total organics which were less than a few micrograms in a 100-microgram sample. Aerosols were also sought in a NO2, 1-hexene, and dry air mixture, but have not yet been obtained. (Author abstract modified)

37356 **APTIC NO. 59477**

Marzoch, D.

A COMPARISON BETWEEN MEASURED TRANSMISSION AND EMISSION SPECTRA AND CALCULATED SPECTRA IN THE 9.6 MICRON REGION OF OZONE. *(Ein Vergleich gemessener Transmissions- und Emisionsspektren mit berechneten Spektren in der 9.6 Bande des Ozens). Ludwig- Maximilians-Universitat, Munich (West Germany) Rept. MBFT-FBW- 73-01, 52p., Jan. 1973. Translated from German, Leo Kanner Associates, Redwood City, Calif., NASA TT F-15,110, 39p., Sept. 1973. 27 refs.*

NTIS: N73-31356

Measurements of the atmospheric transmission and emission in the 9.6 micron region of ozone were compared with the calculated spectra obtained from Clugh and Kneizys theoretical line parameters. The use of these line data recently fitted to laboratory measurements of McCaa and Shaw by Rest was found to lead to incorrect results. Spectra computed with the latest theoretical line data compared well with transmission measurements made from the ground, although comparison with infrared interferometer spectrometer data obtained from the Nimbus 3 satellite revealed a noticeable discrepancy. (Author abstract modified)

37357 **APTIC NO. 60064**

Ramana Rao, V. V. and B. Kama Sastry

FLOW OF A CONDUCTING DUSTY GAS PAST A FLAT PLATE. *Proc. Indian Acad. Sci., Sect. A, 78(6):239-246, Dec. 1973. 6 refs.*

An exact solution is derived by the Laplace-transform technique for the problem of the flow of a conducting dusty gas occupying a semi-infinite space in the presence of a transverse magnetic field. It is assumed that the flow is independent of the distance parallel to the plate and that the mass concentration of the dust is small. Formulas are derived in terms of a constant external impulsive velocity field for the velocity profiles of both the dust and the conducting gas only for values of the Hartmann number greater than or equal to unity. For these values of the Hartmann number, the skin friction is also obtained. For the mass concentration equal to 0.2, for a fixed time, and at any fixed point of the fluid, the effect of increasing the Hartmann number is to increase both the dust and gas velocities. For the same mass concentration, for a fixed time, the skin friction at the plate decreases with increasing Hartmann number; while for a fixed Hartmann number, the effect of increasing time is to decrease the skin friction. For a fixed Hartmann number and at any fixed point of the fluid, the effect of increasing the time is to decrease the dust velocity and increase the gas velocity. 0For fixed values of time and Hartmann number, both the dust and gas velocities increase as distance away from the plate increases. (Author abstract modified)

37358 **APTIC NO. 59976**

Sano, H.

NOX FORMATION FROM NITROGEN COMPONENTS IN FUELS. *(Nenryo-chu no chisso bun kara no NOx seisei). Text in Japanese. Netsu Kanri to Kogai (Heat Mangement Public Nuisance), 25(11):67-72, Nov. 1973. 16 refs.*

Nitric oxide in the waste gases from a furnace which is formed from the nitrogen content of the fuel used is called fuel NO. Nitrogen content respectively decreases in solid, liquid, and gaseous fuels. The conversion ratio from nitrogen to fuel NO is generally lower than 30%, and imported crude oil which has a 0.2% N2 content gives off very little fuel NO. Conversion ratios increase in low temperature combustion conditions, with a flame temperature of 800 C giving maximum increases in fuel NO. Use of a high temperature flame will reduce emissions of fuel NO.

37359 **APTIC NO. 60327**

Scheer, M. D.

CHEMICAL KINETICS DATA SURVEY. THE REACTION OF H WITH H2O2. *In: Chemical Kinetics Data Survey. VI. Photochemical and Rate Data for Twelve Gas Phase Reactions of Interest for Atmospheric Chemistry. National Bureau of Standards, Washington, D. C., Physical Chemistry Div., NBSIR 73-207, p. 4-6, Aug. 1973. 5 refs.*

Chemical kinetics data for the reaction of hydrogen atom with hydrogen peroxide are reviewed. Two channels are recognized as possible for the reaction: that giving hydrogen and hydrogen dioxide (HO2) and that giving water and hydroxyl (HO). The preferred value of the rate constant for the first reaction is 2.8 times 10 to the minus 12 exp (minus 1900/T) cu cm/molecule times s (300-800 K), while no value is recommended for the second.

37360 **APTIC NO. 60003**

Sentek, Antoni

CALCULATION OF THE REAL IN-THE-AIR CONCENTRATIONS OF VAPORS OF HYDROCARBON AND HYDROCARBON DERIVATIVE SOLUTIONS. *(Wyznaczanie w powietrzu rzeczywistych stezen skladnikow par roztworu weglowodorow i ich pochodnych). Text in Polish. Ochrona Pracy (Warsaw), 27(11):13-16, Nov. 1973. 14 refs.*

Equations are presented for the calculation of the real concentrations of hydrocarbon vapors and their derivative solutions in the air. The equations are based on the dependence of the contents in the gaseous phase on the contents in the liquid phase for balanced systems of the liquid vapor type, according to Raoult s law. The equations presented are useful for solving the problems of explosions, fires, and poisonous gaseous mixtures in oil refineries, dye and lacquer factories, and chemical plants.

37361 **APTIC NO. 59467**

Spencer, F. E., Jr. and A. A. Orning

AN ALGORITHM FOR CALCULATING MULTIPHASE CHEMICAL EQUILIBRIUM. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Energy Research Center, RI 7786, 44p., 1973. 12 refs.*

An algorithm for computer program calculation of multiphase chemical equilibrium is described. The program was developed particularly for the purpose of studying problems in coal combustion, although the program s generality will allow its application to any equilibrium system in which an appreciable gas phase is present. Its application to coal combustion problems permits the prediction of composition and quantity of slag and unconsumed carbon phases as well as the calculation of gas phase composition, including trace species such as free electrons. The program has also been used in studying certain aspects of sulfur oxide control and coal gasification. (Author abstract modified)

37362 **APTIC NO. 60310**

Swartz, Paul, Khee M. Chng, and Richard D. Siegel

COMPUTER PROGRAMS FOR THE CONVERSION OF ILLINOIS STATE AIR QUALITY DATA TO THE SAROAD FORMAT (FINAL REPORT). *Walden Research Corp., Cambridge, Mass., Office of Air and Water Programs Contract 68-02-0049, Program Element 2AE132, Environmental Protection Agency-450/3-74-019, 76p., Dec. 1973. 4 refs.*

Two computer programs used to convert the State of Illinois air quality data to the SAROAD format are described. The PREPROCESSOR preprocesses the Illinois data on tape and writes an output tape for the main program, the CONVERSION. The PREPROCESSOR is written in ASSEMBLY to facilitate the unpacking of some of the data records which are in packed decimal format. The CONVERSION is written in FORTRAN IV and does all the necessary conversion to the SAROAD format. The report includes: program functions, input data description, a sample case, and operational information. Additionally, source listings for both programs, the JCL requirements, and the necessary modifications to the CONVERSION program to accommodate site or pollutant additions are included in the Appendices.

37363 **APTIC NO. 60143**

Takahashi, T., H. Yamamoto, and Y. Fujima

TECHNOLOGICAL MODEL OF NOX EMISSION IN COMPLETE PREMIXED FLAME, PART I, ON EXCESSIVE AIR REGION. *(Kanzen yokongo gasu kaennai NOx hassei no kogakuteki moderu, dai 1 po kajo kuki ryoiki nitsuite). Text in Japanese. Preprint, Combustion Inst. (Japan), p. 127-130, 1973. 6 refs. (Presented at the Symposium on Combustion, 11th, Tokyo, Japan, Dec. 6-7, 1973, Paper 35.)*

Based on experiments of an industrial-scale premixed burner, an activation energy (E) was derived for nitric oxide formation during combustion with excess air and a computation model for NO formation was developed. The following simple rate equation was used in the computation of NO formation: d(NO/dt equals A EXP (-E/RT) sq root (O2)(N2)/sq root T. Nitric oxide increases with higher air-fuel ratios and peaks at A/F 1.1, and then decreases with further increases in A/F. An apparent activation energy of 75 kcal/mol was obtained at the oxygen concentration of 1.5 or higher using the above rate equation. The constant A in the equation was determined to be 1.332 times 10 to the power of 11 ppm. The variation of NO was computed as a function of A/F. Moreover the effects of inert gas content and premixing temperature on the formation were computed. The computation using E of 75 kcal/mol agrees with the experimental results.

37364 **APTIC NO. 60174**

Takiguchi, Yoshimi, Takeyoshi Kamiyama, and Kiyotaka Sakai

A STUDY OF NOX PRODUCTION DURING AMMONIA COMBUSTION. *(Anmonia nensho ni yoru NOx seisei ni kansuru kenkyu). Text in Japanese. Preprint, Japan. Society of Chemical Engineering, Tokyo, p. 117-118, 1973. (Presented at the Japan Society of Chemical Engineering Fall Meeting, 7th, Nagoya, Japan, Oct. 13-16, 1973.)*

To determine the relative amount of nitrogen oxides production which originate either from nitrogen in air or nitrogen compounds in fuel during combustion, amount of NOx produced during combustion of ammonia in NH3-O2-N2 and NH3-O2-argon mixtures was measured by the Saltzman method at various ratios and pressures. Increases in NH3 and O2 initially increased production of NOx and then a decrease was noted. About 2/3 of NOx was produced from NH3 combustion while 1/3 of the gas came from N2 in air, irrespective of combustion temperature.

37365 **APTIC NO. 59610**

Ueno, Yasuo and Isamu Sano

STUDIES OF SALT SOLUTION AEROSOLS. XI. THE COAGULATION RATE OF AN AQUEOUS SALT SOLUTION AEROSOL OF SODIUM SULFATE AND ITS APPLICATION TO THE ESTIMATE OF THE STABILITY OF AEROSOLS. *Chem. Lett., no. 12:1283-1288, 1973. 8 refs.*

The coagulation rate of an aqueous salt solution aerosol of sodium sulfate was determined in terms of number and mass concentration under various conditions. The rate of mass concentration decrease follows a process of second order reaction. The particle size increases with time and becomes larger with the increase in humidity. The effect of humidity on the stability of the aerosol is tabulated together with the size ratio at half decay period of mass concentration. Humidity acts as a coagulation promoting agent whose influence is represented by the mass coagulation rate constant. (Author abstract modified)

37366 **APTIC NO. 59309**

Wayland, Bradford B. and Larry W. Olson

NITRIC OXIDE COMPLEXES OF IRON (II) AND IRON (III) PORPHYRINS. *Chem. Commun., no. 23:897-898, Dec. 1973. 10 refs.*

Nitric oxide complexes of iron (II) and iron (III) porphyrins were investigated. The reversible formation of a NO adduct with tetraphenylporphyriniron (III) (TPP) chloride formulated as (Fe2(TPP)Cl(-)NO(+)) is observed in toluene, but reductive nitrosylation to given Fe2(TPP). Nitric oxide occurs in the presence of a hydroxylic solvent, in reactions analogous to hemeprotein interactions with NO. (Author summary modified)

37367 **APTIC NO. 60183**

Yasuda, K. and Y. Murakami

REACTION OF CO AND NO OVER VARIOUS OXIDE CATALYSTS. *(Kakushu sankabutsu shokubai niyoru CO to NO no hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 126-127, 1973. 1 ref. (Presented at the Symposium on Catal. 33rd, Hiroshima, Japan, Oct. 10-11, 1973.)*

An investigation was made on reduction of nitric oxide by carbon monoxide over various metal oxides such as TiO2, V2O5, Cr2O3, MnO2, Fe2O3, Co3O4, NiO, Cu2O, and ZnO. The reaction was compared with the CO-oxygen reaction over these catalysts and the role of NO was discussed in terms of its oxidizing ability. Over TiO2 and V2O5, even at 450 C no conversion was obtained for CO-NO reaction and less than 5% conversion was obtained for CO-O2 reaction. Over Cu2O, a stable surface oxidation state could not be attained so that comparison between two reactions was not possible for this catalyst. Over the other catalysts, at low conversion rate

MnO2 was the most active, followed by Co3O4, Fe2O3, Cr2O3, NiO, and ZnO for both reactions. However at high conversion rate, Fe2O3 was the most active followed by Co3O4, MnO2, Cr2O3, NiO and ZnO for the CO-NO reaction, while in the CO-O2 reaction the sequence similar to that at the low conversion rate was obtained. Formation of N2O and N2 suggests that NO is reduced to N2 via N2O. At the conversion rates the activity was decided by the rate of partial reduction of NO to N2O, while at the high conversion rate, it is decided by the rate of reduction of N2O to N2. The rate-determining step of the CO-NO reaction is reoxidation of the catalyst surface by NO.

37368 **APTIC NO. 59534**

Dept. of Commerce, Washington, D. C., National Bureau of Standards

CHEMICAL KINETICS OF REACTIONS OF CHLORINE, CHLORINE OXIDES AND HYDROGEN CHLORIDE IN GAS PHASE: A BIBLIOGRAPHY. *NBS List of Publications, 71, 23p., Dec. 1973. 75 refs.*

A bibliography on the chemical kinetics of reactions of chlorine, chlorine oxides, and hydrogen chloride in the gas phase is presented. Research papers are listed on the reactions of Cl, Cl2, Cl2O, Cl2O2, ClO, ClO2, and HCl with each other and with some of the following molecules: methane, carbon monoxide, H, hydrogen, N, nitric oxide, nitrogen dioxide, O, oxygen, and ozone. With a few exceptions, the bibliography emphasizes those reactions in which the chlorine oxides appear, either as reactants or as products. The bibliography is based on the files of the Chemical Kinetics Information Center and an examination of Chemical Abstracts 1953-1973. Most papers were published since 1966.

1972

37369 **APTIC NO. 59215**

Boehme, G., E. Robens, H. Straubel, and G. Walter

DETERMINATION OF RELATIVE WEIGHT CHANGES OF ELECTROSTATICALLY SUSPENDED PARTICLES IN THE SUB-MICROGRAMME RANGE. *Preprint, 13p., 1972. 7 refs. (Presented at the Conference on Vacuum Microbalance Techniques, 10th, Uxbridge, England, July 10-12, 1972.)*

NTIS: N72-33451

Electrically charged particles with masses in the nano and picogram range were suspended electrostatically in the inhomogeneous alternating field of a three-plate capacitor. The alternating field keeps the particles in a stable position in the bore-hole of the intermediate electrode; a constant field between the two outer electrodes may be applied to counterbalance the weight of the particles. Relative mass changes due to the sorption of vapors were determined from the onset of the oscillation caused when the stabilizing a.c. voltage was raised. In this way weight changes of less than 1 pg were observed. The experiments were performed to determine whether this method can be used for gravimetric analyses of the reaction kinetics between gases and solids. In addition, the experiments were performed to investigate the potential applications, the measuring range, and the sensitivity of the method. The method extends the gravimetric technique into the picogram range. It can be used to analyze reactions of particulate matter with a gas under conditions similar to those in practice. (Author abstract modified)

37370 **APTIC NO. 59496**

Hammer, Hans and Hans-Werner Langensiepen

ON THE SIMULATION AND OPTIMIZATION OF THE CATALYTIC CONVERSION OF CARBON MONOXIDE TO METHANE IN A GAS-LIQUID REACTOR. *(Zur Simulation und Oprimierung der katalytischen Methanisierung von Kohlenmonoxid in einem Gas/Fluessigkeits-Reaktor). Text in German. Chem.-Ingr.-Tech., 44(11):712-716, 1972. 11 refs.*

The minimum necessary reactor height for a column-type bubble reactor with a suspended catalyst for the conversion of carbon monoxide to methane was determined on the basis of digital simulation with a macrokinetic model. Hydration in fused hard paraffin at 230-270 C with a nickel-magnesia catalyst were chosen for the macrokinetic model. The minimum necessary reactor height was a function of the catalyst concentration and of the gas flow rate. The model is not applicable to flow rates causing settling of the catalyst. The minimum reactor height was at gas flow rates ranging from 4 to 5 cm/sec. The value obtained for the minimum necessary reactor height is modified by the degree of activity of the catalyst. With decreasing catalytic activity, the minimum of the reactor height shifts towards lower gas flow rates.

37371 **APTIC NO. 59528**

Homann, K. H. and D. I. MacLean

STRUCTURE OF FLUORINE SUPPORTED FLAMES. II. CONCENTRATION PROFILES FOR FLAME OF THE SYSTEMS: H2-F2, H2-F2-NH3, NH3-F2, C2H2-F2 AND C2H4-F2. *Boston Coll., Chestnut Hill, Mass., Dept. of Chemistry, Office of Naval Research Contract NOOO14-69-A-0453, Task NR-92-536/4-25-69(473), FRK-117, 30p., May 1972. 13 refs.*

NTIS, DDC: AD 743501

Concentration profiles of reactants, stable products, and reactive intermediates were measured in low pressure flames of the following systems burning on a multi-diffusion burner: hydrogen- fluorine, hydrogen-fluorine-ammonia, acetylene-F2, and ethylene-F2. In the first system, preliminary results for the H2 and F-atom profiles were in good agreement with independent measurements of the elementary reaction F + H2 yields hydrofluoric acid + H. In the H2-F2-NH3 system, ammonia acts as an inhibitor in the H2-F2 flames due to the formation of solid ammonium fluoride. The main products of the C2H2-F2 flame are HF and carbon fluoride (CF2). The CF2 recombines to C2F4 when the burned gas is cooled. The nature of the intermediates indicates that addition reactions of F and F2 to unsaturated hydrocarbons and their radicals, respectively, are important. The formation of soot in this flame is compared to that in an acetlyene-oxygen flame. Since a large amount of C2H4 is decomposed to C2H2 in primary reactions of the C2H4-F2 system, the concentration profiles in this flame are very similar to those in a C2H2-F2 flame. (Author abstract modified)

37372 **APTIC NO. 59487**

Marenco, Alain

SIMULATION OF THE HOLD TIME OF SOLID POLLUTANTS IN THE TROPOSPHERE BY NUMERICAL MODEL. *(Etude par simulation sur modele numerique du temps de sejour des polluants solides dans la troposphere). Text in French. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. 19 refs. (May 3-5.)*

A numerical model for the calculation of the hold time of solid air pollutants in the troposphere as a function of vertical exchange processes, sedimentation, washout, and source altitude is described. The hold time of a particular solid pollutant in the troposphere is principally determined by the altitude at which it is emitted. The hold time in the troposphere increased with the source height, and decreased with increasing washout intensity. Pollutants emitted near ground level are eliminated from the atmosphere mainly by settling, and have a hold time of about 15 days in the troposphere. Pollutants emitted at high altitudes in the troposphere, or such coming from the stratosphere, are eliminated from the atmosphere chiefly by washout, and have a hold time of about 100 days. The pollutants emitted in the troposphere, including its lowest layer, can be traced for hold time investigation by means of 210 Pb, 210 Bi, and 210 Po isotopes, while 7Be is suitable for the investigation of pollutants emitted in the high troposphere.

37373 **APTIC NO. 59509**

Selamoglu, Suha

DETERMINATION OF THE ATMOSPHERIC TEMPERATURE DENSITY PROFILES FROM FREE DESCENT OR ASCENT OF A SPHERE OF CONSTANT VOLUME AND MASS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p XIII-1-XIII-10. 3 refs. (Oct. 2-3.)*

A mathematical analysis is presented to demonstrate the possibility of determining the density, temperature, and pressure profiles of the atmosphere by means of the free motion of a constant volume, constant mass sphere. The density profile of the atmosphere may be related to the velocities which would be acquired by a spherical body in its free fall or ascent in the atmosphere; and, under reasonable assumptions, the information on one of them, e.g., density, may be sufficient to determine the others. The practicability of the method and the associated problems and difficulties, such as those due to vertical winds, need further study, however.

37374 **APTIC NO. 59868**

Yoshihara, T., S. Watanabe, C. Okumoto, I. Toyama, and S. Matsumoto

ON TETRAALKYL LEAD AND AROMATIC HYDROCARBONS IN COMMERCIAL GASOLINE. *(Shihan gasolin chu no 4-alkyl namari oyobi hokozoku tankasuiso ni tsuite). Text in Japanese. Tokyo-to Eisei Kyoku Gakkai-shi (Rept. Tokyo Public Health Studies), no. 50:48-49, Oct. 1972.*

Commercial gasoline was refluxed with concentrated hydrochloric acid to convert alkyl lead into lead chloride, which was extracted with an acid. The extract was evaported to dryness. Organic materials were removed by oxidation with nitric acid. Then the sample solution was diluted with 0.1N HCl to a definite volume. The lead content in this solution was determined with a polarograph. Lead nitrate solution was used as a standard solution of lead For the determination of aromatic hydrocarbons such as benzene, toluene, and xylene, commercial gasoline was diluted if necessary with n-hexane. The determinations were made with a Yanagimoto Chromatography Type G8 and a Shimadzu gas chromatograph Type 4BMPF. The determination was made by the use of calibration curves prepared prior to the measurement of commercial samples. The results indicated that the tetraalkyl content of commercial gasoline decreased markedly since the improvement of the law in 1971, which forced the tetraalkyl lead content to decrease from 1.3 cu cm/l to less than 0.3 cu cm/l. A considerable increase was noticed in the contents of benzene, xylene, and toluene, on the contrary.

1971

37375 **APTIC NO. 59448**

Andreyev, S. D., L. S. Ivlev, and Ye. L. Yanchenko

OPTICAL CHARACTERISTICS OF ATMOSPHERIC AEROSOLS IN THE NEAR INFRARED REGION OF THE SPECTRUM. *(Opticheskiye kharakteristiki atmosfernogo aerozolya v blizhney Ik oblasti spektra). Probl. Fiz. Atm., no. 9:48-58, 1971. 19 refs. Translated from Russian, Leo Kanner Associates, 15p., July 1973. (U. S. Army Foreign Science and Technology Center, FSTC-HT-23-2478-72, SI-73-53-639.)*

NTIS: AD 764 135

The behavior of the aerosol attenuation coefficient in the near infrared region of the spectrum was investigated, and its relation to the conditions under which the experiment was carried out is discussed. The experimental results are compared to those obtained from models of atmospheric aerosols. The Junge distribution is a sufficiently good model which can be used to calculate the aerosol attenuation coefficient. For other values of a meteorological visibility range, the selection of the model depends on other meteorological factors. If the relative humidity values in the atmosphere are not high, the aerosol particles may be covered by a film of water or ice, which can be detected with the aid of optical measurements at various altitudes of the direct solar radiation in the three micron band. Water aerosols rise higher in summer than in the winter.

37376 **APTIC NO. 59819**

Pressman, A. Ya. and Yu. Z. Sominskiy

FALLOUT OF INHOMOGENEOUS IMPURITIES FROM ATMOSPHERIC SOURCES. *(O vypadenii neodnorodnykh primesey iz atmosfernykh istochnikov). Text in Russian. Dokl. Akad. Nauk SSSR, 200(5):1084-1087, 1971. 4 refs.*

Mathematical formulas describing the fallout of impurities with different degrees of inhomogeneity from atmospheric sources at different altitudes were derived. Specific formulas describing the fallout of impurities with high degree of homogeneity at low initial speed and at low source altitude; that of impurities with any final degree of homogeneity at a relatively high fallout speed and at any source height, and that of impurities with a low degree of homogeneity from relatively high sources and at any final speed are presented. Formulas for homogeneous impurities can not be directly applied to the description of the fallout of non-homogeneous impurities.

1969

37377 **APTIC NO. 59901**

Eichmeier, J.

LIMITING MOBILITY AND RESOLVING POWER OF AN ION MOBILITY SPECTROMETER WITH PLANE ASPIRATION CONDENSER. *(Grenzbeweglichkeiten und Aufloesungsvermoegen eines Ionenbeweglichkeitsspektrometers mit plattenfoermigem Aspirationskondensator). Text in German. Z. Geophys., vol. 35:413-417, 1969. 4 refs.*

Formulas for the determination of the limit mobility and of the resolving power of plane aspiration condensers with undivided or bipartite measuring electrodes and ion gaps, designed for the measurement of the mobility spectra of atmospheric ions, are presented. The revolving power of cylindrical systems increases with the decrease of the ratio of the measuring electrode length to the effective length of the aspiration condenser, and with the decrease of the ion gap breadth.

37378 **APTIC NO. 59216**

Fedoseyev, V. A.

EVAPORATION AND COMBUSTION OF THE AERODISPERSED SYSTEMS. *Fiz. Aerodispersnykh Sist., no. 1:86-100, 1969. Translated from Russian. Air Force Systems Command, Wright-Patterson AFB, Ohio, Foreign Technology Div. Translation Div., FTD-MT-24-1245-71, 19p., 1969.*

NTIS, DDC: AD 743749

The laws governing aerodispersion systems can be applied to clouds and fogs in nature, artificial waves of aerosols, dispersion of fuel in engines, and air pollution by dust and smoke. Evaporation and combustion of aerodispersed systems was studied in an experimental facility where the evaporation or combustion appear as a luminous trace to the observer. The facility can be used to determine such evaporation and combustion characteristics as the time and rate of evaporation or combustion of droplets and particles, the induction period of preignition processes, mass and heat transfer characteristics, the influence of the temperature of the medium on the combustion rate, the influence of a gas medium and of various additions to the air, the completeness of combustion and the physicochemical composition of the combustion products, the emission of individual particles and of particle groups, the influence of catalytic additions and impurities, and the combustion of aerosols.

37379 **APTIC NO. 59779**

Horvath, H.

LETTER TO THE EDITORS: A SIMPLE MODIFICATION OF THE LA MER GENERATOR. *J. Colloid Interface Sci., 29(4):733-735, April 1969. 6 refs.*

A modification of the La Mer liquid droplet generator has been developed for achieving variable particle size. The ratio of the amount of liquid/cu cm to the number of condensation nuclei/cu cm, which is approximately proportional to the volume of the droplets, was varied by the use of two atomizers with completely different particle size distribution; mixing ratio of the two aerosols was also varied. Use of either atomizer exclusively allowed for generation of either the largest or smallest monodisperse droplets possible, while sizes in between this range were produced by adjustment of bypass valves from the atomizers. The generator employed an intentionally impure liquid (dioctylphthalate, dibutyl phthalate, or paraffin oil) to allow for the remaining of a small residue after evaporation which served as a condensation nucleus. A size range of approximately .15-1.0 micron in radius was easily covered with the method.

1968

37380 **APTIC NO. 59780**

Douglass, Irwin B. and Richard V. Norton

A SUPERIOR METHOD FOR PREPARING SULFINYL CHLORIDES. *J. Org. Chem., 33(5):2104-2106, May 1968. 7 refs.*

A superior method for preparing sulfinyl chlorides has been devised which overcomes the disadvantage of hydrogen chloride production in large volume. Chlorination at 0 to -10 C of an anhydrous mixture of alkyl or aryl disulfide and acetic anhydride resulted in smooth conversion of the disulfide into the corresponding sulfinyl chloride and conversion of the anhydride into acetyl chloride. Chlorination end point was indicated by the disappearance of the colored sulfinyl chloride formed by the reaction of disulfide and chlorine. An excess of disulfide or the solvolytic reagent was avoided; and it was necessary to remove the acetyl chloride under the reduced pressure of a water pump, collecting it in a vessel of adequate capacity cooled to the temperature of dry ice, in isolating the sulfinyl chloride. Yield was about 85% without recovery of the sulfinyl chloride by codistilling with acetyl chloride. Aromatic sulfinyl chlorides were found unsuitable for distilling; an attempt to distill p-toluenesulfinyl chloride led to an explosion. Experimental procedures are given for the preparation of methanesulfinyl chloride, ethanesulfinyl chloride, butanesulfinyl chloride, and benzenesulfinyl chloride.

37381 **APTIC NO. 59905**

Erin, T. and C. D. Hendricks

UNIFORM CHARGED SOLID PARTICLE PRODUCTION. *Rev. Sci. Instrum., 39(9):1269-1271, Sept. 1968. 5 refs.*

An apparatus has been developed for the production of uniform charged solid particles of less than 250 micron in diameter which can be usefully applied to smog control research as well as other areas of study. A perturbation is applied to a liquid jet which then breaks up into uniform droplets as a result of the Rayleigh instability; the droplets are charged by an electric field as they form. The charged droplets are then frozen by allowing them to fall into an environment whose temperature is below the freezing point of the material. The material used is sodium nitrite, and the uniform particles can be produced between 90-150 micron in radius while falling a distance of less than 1.5 m. Statistical standard deviation in diameter is less than 1 micron. (Author abstract modified)

37382 **APTIC NO. 60323**

Hendricks, Charles D.

UNIFORM PARTICLE SOURCES FOR POLLUTION RESEARCH. *J. Air Pollution Control Assoc., 18(10):669-670, Oct. 1968.*

Techniques are outlined for the production and control of liquid drops and solid particles useful in the study of particulate air pollution problems. Uniform liquid drops in the 1.0 to 500 micron range may be produced by utilizing the spatial growth properties of a capillary wave on a moving jet. The wave may be launched on the jet by mechanical driving of the capillary, by ac electric fields, or by a pulsed electron beam, if done in a vacuum. Particle charge control is accomplished by placing a cylindrical electrode concentric to the jet. Suitable programming of the charging potential can produce predetermined drop charges, and a set of deflection electrodes can be employed to separate the drops or deflect them in an otherwise prescribed manner. A multiple jet system can also be employed by utilizing a perforated plate or screen through which the liquid is forced. Copious quantities of particles in the 0.01-1.0 micron range can be produced by application of a sufficiently high electric field to the surface of a liquid, thus producing surface instabilities which may give rise to very small particles. Particle size depends on the liquid parameters (viscosity, surface tension, electrical conductivity) and the system parameters (potential, geometry, flow rate). Solid particles can be formed in much the same manners by forming the jet from a molten material which is allowed to cool and solidify into solid particles after being formed into drops. Similarly, the desired solid may be dissolved in a high vapor pressure solvent which is allowed to evaporate after the drop formation, thus giving rise to solid particles.

1967

37383 **APTIC NO. 59936**

DeGraff, Benjamin A. and Jack G. Calvert

A STUDY OF THE PRIMARY PROCESSES IN CH2O AND CD2O PHOTOLYSES. *J. Am. Chem. Soc., 89(10):2247-2253, 1967. 41 refs. (Presented at the Informal Conference on Photochemistry, 7th, Troy, N. Y., June 1966.)*

The primary processes occurring on the photolysis of formaldehyde and formaldehyde-D2 (CD2O) were delineated at 3340, 3130, 2654, and 2537 A, through experiments with added olefin, neopentane, and biacetyl. The data provide estimates of primary quantum efficiencies of the processes: CH2O + Plancks constant (nu) yields H + HCO (I) and CH2O + h(nu) yields hydrogen + carbon monoxide (II). Information is also obtained on the nature and the lifetimes of the excited states involved in these processes. The data show that process I is favored at the longer wavelengths (3340 A), while II dominates at the shorter wavelengths (2537 A). Data from the photolyses of pure formaldehyde and its mixtures with propylene show values of phi CO and phi H2 which are significantly greater than zero. The data are most consistent with the occurrence of a newly postulated reaction sequence (H + CH2O yields CH3O; CH3O + CH2O yields CH3OH + HCO), which leads to methanol formation and a CO excess. The additional possibility exists of a contribution to the CO excess from a third primary process, CH2O + CH2O yields CH2OH + HCO (III), particularly in photolyses at the very long wavelengths (3660 A). (Author abstract)

37384 **APTIC NO. 59746**

Jaffe, Sigmund and Hadley W. Ford

THE PHOTOLYSIS OF NITROGEN DIOXIDE IN THE PRESENCE OF NITRIC ACID AT 3660 A AND 25 DEG. *J. Phys. Chem., vol. 71:1832-1836, 1967. 11 refs.*

Nitrogen dioxide was irradiated at 3660 A in the presence of nitric acid. Both NO2 and HNO3 were decomposed. The proposed mechanism for HNO3 decomposition is oxygen + HNO3 yields hydroxyl radical + nitrogen trioxide followed by OH + HNO3 yields water + NO3. The specific rate constant for the O + HNO3 reaction is estimated to be 10 to the 10th power l/mole/sec. Quantum yields are reported as a function of NO2, HNO3, and nitric oxide pressures. (Author abstract)

37385 **APTIC NO. 59939**

Schlag, E. W., H. von Weyssenhoff, and M. E. Starzak

ABSOLUTE MEASUREMENT OF INELASTIC COLLISION CROSS SECTIONS FOR VIBRONIC EXCITED STATES. *J. Chem. Phys., vol. 47:1860-1862, 1967. 22 refs.*

Collisional transport is one of the major pathways in energy transfer processes and in theories of chemical kinetics. The simplest theoretical formulation of collision frequencies is based on the kinetic theory of gases, and calculates cross sections from observed momentum transport data, such as gas viscosities. Measurements of cross sections were made on a laboratory time scale comparable to the duration of these highly excited internal processes and gave absolute values for the rates of these internal processes. An example is given of measurements of inelastic collision cross sections by a determination of absolute collision frequencies as a function of vibronic energy for the system beta-naphthylamine dispersed in propylene as a heat bath. The relative rates of excited state processes in beta-naphthylamine were measured employing the fluorescent enhancement technique of Neporent, which measures the enhancement in fluorescence intensity due to the addition of an inert gas. Such an inert gas leads to vibrational relaxation in the excited state, whereas oxygen and nitric oxide act as quenching gases. The technique is calibrated by assuming a knowledge of the collisional quenching rate for oxygen based on the kinetic theory. Since this system appeared to be well behaved, it was also used as the test case in this lifetime study. The absolute values for the collision frequencies for varying vibronic states determined confirmed the hypothesis that collision frequencies are not a strong function of vibronic energy, particularly for higher energies. However, the absolute values were about an order of magnitude less than predicted by the kinetic theory of gases.

1966

37386 **APTIC NO. 59903**

Schuck, E. A., E. R. Stephens, and R. R. Schrock

RATE CONSTANT RATIOS DURING NITROGEN DIOXIDE PHOTOLYSIS. *J. Air Pollution Control Assoc., 11(12):695-696, Dec. 1966. 10 refs.*

Nitrogen dioxide is the light absorber in the hydrocarbon system leading to production of photochemical air pollution. Studies of the reactions involved are based on the kinetics of NO2 photolysis and the values of the rate constants derived. The photolysis of NO2 was investigated in the 2-20 ppm concentration range. The value of the bimolecular rate constant of the reaction between oxygen atoms and NO2 was 5.26 times 10 to the 9th power l/mole/sec, and the termolecular rate constant of the reaction between oxygen atoms and NO2 in the presence of a third body was 4.24 times 10 to the -10th power l squared/sq mole/sec. The rate constant for the reaction between oxygen atoms and nitric oxide in the presence of a third body was 2.31 times 10 to the 10th power l squared/sq mole/sec. Nitrogen was used as the third body. In terms of order of magnitude, these calculated rate constants are similar to previously reported values. However, in certain cases their use leads to an oxygen atom concentration which is 100% greater than previously calculated. (Author abstract)

1965

37387 **APTIC NO. 60305**

Zlatkis, Albert and J. E. Lovelock

AFFINITY OF ORGANIC COMPOUNDS FOR FREE ELECTRONS WITH THERMAL ENERGIES. *Clin. Chem., 11(2):259-269, Feb. 1965. 11 refs.*

The free electron may be regarded as a fundamental particle in the study of chemical and biologic reactions. Therefore the reactions of free electrons with organic compounds were studied. The physical basis, scope, and limitations of a method for measuring the cross section for electron absorption and the electron affinity of organic compounds were studied. The relative absorption cross sections for organic compounds, including ones of biologic interest, are also discussed. The construction of the simple plane parallel ion chamber is discussed. This instrument was used to determine the electron absorption coefficients of hydrocarbons, nitro compounds, halogenated derivatives of low molecular weight, other halogen compounds, and miscellaneous compounds. Some of these were 0.02-29 for polycyclic aromatic hydrocarbons, 390 for nitrobenzene, 55 for allyl chloride, 115 for tetraethyl lead, and 440 for carbon disulfide. Electron absorption coefficients are also given for conjugate electrophores. Classes of toxic compounds with large coefficients for the absorption of thermal electrons and the range of the absorption coefficients are pesticides (halogenated pesticides, 300-3000 and pyrethrins, 100-1000), fungistatic compounds (300-10,000), hypnotics (100-300), compounds able to uncouple oxidative metabolism (1000), chemical carcinogens (30-10,000), and lachrymators (300-1000).

1964

37388 **APTIC NO. 59898**

Hidy, George M. and S. K. Friedlander

VAPOR CONDENSATION IN THE MIXING ZONE OF A JET. *J. Am. Chem., Soc., 10(1):115-124, Jan. 1964. 30 refs. (Presented at the American Institute of Chemical Engineers, San Juan Meeting.)*

Experimental studies were made of fog formation in free jets containing glycerine and dibutyl phthalate aerosols. Visual and photographic observations showed that condensation took place near the nozzle in the mixing zone between the jet and the ambient air. Fog formation began at a well-defined location downstream from the nozzle depending on the initial velocity, temperature, and concentration of vapor. The location could be changed by inserting solid bodies or by adding foreign nuclei to the mixing zone. Measurements were made of mean temperature and concentration profiles in the mixing zone with noncondensable gases. These compared well with the predictions of turbulent boundary-layer theory. Calculations were made of the supersaturation to be expected in the case of glycerine. Downstream of the point where condensation first occurred, fog filled most of the region where the calculated supersaturation was above unity. Based on the experimental evidence, a mechanism is proposed for condensation in a free jet. (Author abstract)

37389 **APTIC NO. 59745**

Swift, David L. and S. K. Friedlander

THE COAGULATION OF HYDROSOLS BY BROWNIAN MOTION AND LAMINAR SHEAR FLOW. *J. Colloid Sci., vol. 19:621-647, 1964. 35 refs.*

The coagulation of hydrosols was investigated theoretically and experimentally. A reduced form of the particle size distribution function, designated self-preserving, satisfied Smoluchowki s equations of coagulation by Brownian motion and shear flow. Brownian motion coagulation experiments with two heterogeneous hydrosols showed that the distributions were self-preserving. The rate of coagulation for heterogeneous systems was second order in total particle concentration, consistent with the self-preserving form of the distribution function. Coagulation experiments were carried out in a simple laminar shear field using a homogeneous Dow polystyrene latex dispersion. Smoluchowski s shear flow theory was confirmed for shear rates ranging from 1 to 80/sec. The shear coagulation of a heterogeneous emulsion was studied at several shear rates, and the size distributions were self-preserving. (Author abstract)

EFFECTS-HUMAN HEALTH

1974

37390 **APTIC NO. 60169**

Araki, S., T. Aman, K. Ushio, and T. Honma

RESPIRATORY ALKALOSIS ASSOCIATED WITH THE CASES OF MASS OUTBREAK OF SO-CALLED PHOTOCHEMICAL SMOG DISEASE (TOKYO SMOG). *(Iwayuru kokagaku sumoggu (Tokyo sumoggu)sho no shudan hassei shorei ni mirareta kokyusei arukarosis). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(2):75-80, Feb. 1974. 21 refs.*

Sixteen of the reported 122 cases of health impairment due to the smog episode in Tokyo on June 1, 1972 are discussed. Symptoms consisted of eye irritation, nasal and throat discomfort, headache, muscular aches, nausea, muscle spasms, respiratory distress. Physical and laboratory tests on the patients blood, urine, heart, and liver functions showed respiratory alkalosis. Recurrence of the symptoms was not noted after 1 year. Atmospheric concentrations of nitric oxide and nitrogen dioxide measured 4 months later at the school where the patients were affected were extremely high; the daily mean concentration of NO ranged from 0.041-0.160 ppm for a week and NO2 measured 0.061-0.134 ppm under the same circumstances.

37391 **APTIC NO. 59313**

Aronow, Wilbert S, Edward A. Stemmer, and Michael W. Isbell

EFFECT OF CARBON MONOXIDE EXPOSURE ON INTERMITTENT CLAUDICATION. *Circulation, 49(3):415-417, March 1974. 5 refs.*

The effect of breathing 50 ppm carbon monoxide for 2 hr versus compressed, purified air for 2 hr on intermittent claudication (cardiovascular-induced lameness) was evaluated in 10 men during a double-blind study. The mean venous carboxyhemoglobin level insignificantly decreased from 1.12% to 0.90% after breathing compressed, purified air but significantly increased from 1.08% to 2.77% after breathing carbon monoxide. The mean exercise time until the onset of the intermittent claudication insignificantly increased from 169 to 173 sec after breathing compressed, purified air but significantly decreased from 174 to 144 sec after breathing carbon monoxide. Breathing 50 ppm of CO for two hrs significantly aggravated intermittent claudication of the calf or thigh due to angiographically documentated occlusive arterial disease. (Author abstract modified)

37392 **APTIC NO. 59357**

Atwal, Onkar S.

PARATHYROID GLAND CHANGES FOLLOWING OZONE INHALATION. A MORPHOLOGIC STUDY. *Arch. Environ. Health, 28(2):91-100, Feb. 1974. 48 refs.*

Histological and ultrastructural changes in the parathyroid glands of rabbits were studied after 4 to 8 hr of ozone inhalation at a dosage of 0.75 ppm. More frequent changes observed included production of large numbers of secretion granules; hyperplasia of the chief cells; proliferation and hypertrophy of rough endoplasmic reticulum, free ribosomes, mitochondria, Golgi complex, and lipid bodies; and accumulation of secretion granules inside the vascular endothelium and the blood stream. Morphologic evidence presented indicates that O3 inhalation in rabbits profoundly influences the parathyroid gland. (Author abstract modified)

37393 **APTIC NO. 59352**

Austin, R. H., K. Beeson, L. Eisenstein, H. Frauenfelder, I. C. Gunsalus, and V. P. Marshall

ACTIVIATION ENERGY SPECTRUM OF A BIOMOLECULE: PHOTODISSOCIATION OF CARBONMONOXY MYOGLOBIN AT LOW TEMPERATURES. *Phys. Rev. Letters, 31(8):403-405, Feb. 25, 1974. 6 refs.*

Carbon monoxide bound to myoglobin is capable of photodissociation with high quantum yield. Photodissociation and subsequent rebonding of CO can be observed optically since the absorption spectra of CO-free and CO-bound ferrous heme proteins differ. Rebinding in the temperature range of 40-200 K appears to be described by the function H(t) equals (1 plus t/to) to the minus n power, where H(t) denotes the fraction of Mb molecules that have not rebound CO at the time (t) after the flash and where t(o) and n are temperature dependent parameters. This behavior is explainable by assuming the existence of an activation energy spectrum which may be due to the existence of myoglobin conformers. (Author abstract modified)

37394 **APTIC NO. 59361**

Bittersohl, G.

STUDY OF POSSIBLE INJURIES OF THE CENTRAL NERVOUS SYSTEM BY TOXIC SUBSTANCES OF THE WORKING ENVIRONMENT. *(Beitrag zu Schaedigungs-moeglichkeiten des Zentralnervensystems). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(2):72-78, 1974. 86 refs.*

The effects of toxic substances of the working environment such as carbon monoxide, heavy metals and their alkyl compounds which are primarily lipoid soluble such as ethyl compounds, mercury, and lead tetraethyl, on the central nervous system are reviewed and the morphological, functional, and biochemical processes of this system of organs are discussed. For instance, at carbon monoxide intoxications, the still available oxygen in the blood is tightly bound to the hemoglobin which in turn reduces the oxygen pressure in the blood considerably. In addition, the shift to the left of the O2 dissociation curve cannot be compensated through failure of the 2,3-diphosphoglycerate regulatory mechanism in the erythrocyte. For lipoid soluble substances a free exchange between blood and brain exists. Through inhalation or percutaneous resorotion of such substances, the central nervous system can be directly influenced.

37395 **APTIC NO. 59375**

Burrascano, Joseph J.

CURRENT CONCEPTS IN LUNG CARCINOGENESIS. *N. Y. State J. Med., 74(2):350-355, Feb. 1974. 64 refs.*

Current concepts in lung carcinogenesis are reviewed in terms of the major classes of carcinogens, immune responses, the role of genetics, and the role of environmental factors.

Polynuclear hydrocarbons are chemical carcinogens found in man s environment which are capable of causing transformation in cell culture. Nitrosamines which are formed as products of the interaction of nitrogen oxides and secondary amines appear to be capable of inducing lung cancer. Nonradioactive metals have also been implicated as carcinogens for man; pulmonary carcinomas were produced in rats by inhalation of nickel carbonyl, while 35% of all deaths among nickel workers in an 18 year period were reported to be due to lung cancer. A high percentage of lung cancer among asbestos workers has also been documented, and the percentage increases when workers who also smoked were examined. The rate of increase of lung cancer in the past forty years, a period of industrial proliferation and air pollution build-up, has been 15 times. Ionizing radiation is another carcinogen in the environment, and evidence continues to mount that viruses also play a role in the genesis of human cancer. It appears that host genetic factors, the immune system, and various exogenous factors such as carcinogenic air pollutants all play a role in the development of cancer, and lung cancer in particular.

37396 **APTIC NO. 60222**

Frankel, Lawrence S., Keith S. McCallum, and Ledelle Collier

FORMATION OF BIS(CHLOROMETHYL) ETHER FROM FORMALDEHYDE AND HYDROGEN CHLORIDE. *Environ. Sci. Technol., 8(4):356-359, April 1974. 12 refs.*

The formation of bis(chloromethyl) ether, a recently reported carcinogen, from formaldehyde and hydrogen chloride in moist air was investigated by combining measured amounts of monomeric CH20 and HCl with air in glass vessels or in Saran bags. The resulting amount of BCME was determined by high resolution mass spectrometry and verified in some instances by gas chromatography/mass spectrometry or dual column gas chromatography. Gaseous CH20 and HCl reacted in moist ambient air to form BCME in yields of about 0.01 mol%; and the amount formed was relatively insensitive to moderate changes of temperature or humidity, though strongly dependent on reactant concentrations. (Author abstract modified)

37397 **APTIC NO. 59999**

Gabor, Silvia and Zoe Anca

EFFECT OF SILICA ON LIPID PEROXIDATION IN THE RED CELLS. *Int. Arch. Arbeitsmed., 32(4):327-332, 1974. 26 refs.*

The influence of five varieties of silica dust on lipid peroxidation in erythrocytes was studied in vitro. Control tests were performed on samples of erythrocytes not exposed to dust, which were hemolyzed by freezing and thawing, and on corundum treated red cells. The amounts of the lipid peroxides produced after 1-hour incubation were measured by means of the thiobarbituric-acid test. All the varieties of SiO2 dust investigated induced a significantly higher level of lipid peroxides than was found in the control samples. The hemolysis produced by SiO2 dusts was associated with the formation of an appreciable amount of malonaldehyde, indicating peroxidative cleavage of the polyunsaturated fatty acids. Pretreatment of the dusts with polyvinylpyridine-N-oxide prevented any enhancement of lipid peroxidase activity. The results obtained suggest that lipid peroxidation of membrane-bound polyunsaturated fatty acids may be involved in the cytotoxic activity of SiO2 dust. The damaging effect of SiO2 dust on cells is discussed in the light of the theory of electron catalysis and in terms of damage to membranes by free radicals. (Author abstract)

37398 **APTIC NO. 59356**

Goldstein, Elliot, David Warshauer, William Lippert, and Brian Tarkington

OZONE AND NITROGEN DIOXIDE EXPOSURE. MURINE PULMONARY DEFENSE MECHANISMS. *Arch. Environ. Health, 28(2):85-90, Feb. 1974. 38 refs.*

Mice were exposed to atmospheres of ozone and nitrogen dioxide for 17 hr prior to, or 4 hr after, infection with aerosols of Staphylococcus aureus labeled with radioactive phosphorus in an effort to investigate the possible synergistic effect of these gases on pulmonary resistance to infection. Animals infected and then exposed to various oxidant combinations manifested bactericidal dysfunction only when the level of one of the pollutants approximated its individual threshold value. Similar results were obtained when mice were exposed to pollutants for 17 hr before infection. Hence, the pulmonary consequence of exposure to O3 and NO2 appears equivalent to the injury that would be expected from each individual oxidant. (Author abstract modified)

37399 **APTIC NO. 60013**

Gross, Juergen and Paul Peler

HOLOGRAPHIC STUDY OF THE INHALATION OF AEROSOL PARTICLES ON A MODEL OF THE HUMAN RESPIRATORY TRACT. *(Holographische Untersuchung der Inhalation von Aerosolteilchen in einem Modell des menschlichen Atemtraktes). Text in German. Staub, Reinhaltung, Luft, 34(3):99-100, March 1974. 4 refs.*

The inhalation of a commercial cosmetic aerosol spray (particle diameter greater than 3 microns) was simulated in a model of the human respiratory tract. A decrease of particle density along the respiratory tract by a factor of 0.2 was measured by short-time microholography. If the mouth of the model is sprayed at a small angle the particle density is smaller by a factor of 0.3 than the density obtained when the spray is perpendicular to the mouth. The particle size distribution was determined at three different points of the model. (Author abstract)

37400 **APTIC NO. 60066**

Gross, Paul, Russell A. Harley, Jr., John M. G. Davis, and Lewis J. Cralley

MINERAL FIBER CONTENT OF HUMAN LUNGS. *Am. Ind. Hyg. Assoc. J., 35(3):148-151, March 1974. 8 refs.*

Mineral fibers in the lungs of 13 Pittsburghers and 10 Charlestonians and of seven workers exposed to asbestos dust were quantitated; the methodology is described. Although wide variations in fiber concentration were found in people of the same sex and of the same community, the average concentration of optically visible pulmonary mineral fibers of Pittsburghers was about seven times higher than in Charlestonians. The average pulmonary concentration of optically visible fibers in people not occupationally exposed to asbestos was about 0.7% of the average concentration of optically visible fibers in asbestotic lungs. From 54 to 71% of the electron microscope (EM) visible fibers were less than 5 micron long. Of the EM-size mineral fibers in the lungs of people not occupationally exposed to asbestos, an average of 6.8% were identifiable in chrysotile. Concentrations of mineral dust in the lungs of Pittsburghers and in the lungs of Charlestonians were 9.5 and 2.8 mg/g of dry lung, respectively; concentrations of optical-size mineral fibers were 45,200 and 6500 fibers/g of dry lung, respectively. (Author abstract modified)

37401 **APTIC NO. 59338**

Grover, Philip L.

K-REGION EPOXIDES OF POLYCYCLIC HYDROCARBONS: FORMATION AND FURTHER METABOLISM BY RAT-LUNG PREPARATIONS. *Biochem. Pharmacol., vol. 23:333-343, 1974. 30 refs.*

Epoxides of 7-methylbenz(a)anthracene and of benzo(a)pyrene that have been identified as the K-region epoxides, 7-methylbenz(a)anthracene 5,6 oxide and benzo(a)pyrene 4,5 oxide, have been detected as microsomal metabolites using preparations from the lungs of rats that had been pretreated with the microsomal mixed function oxidase inducer, 3-methylcholanthrene. It was also possible, using lung microsomal preparations from uninduced animals, to deomonstrate the formation of an epoxide identified as the K-region derivative, benz(a)anthracene 5,6 oxide, as a microsomal metabolite of benz(a)anthracene. The K-region epoxides of 7-methylbenz(a)anthracene and of benzo(a)pyrene could not always be detected as metabolites when lung microsomal preparations from uninduced rats were used. The activities of two other enzymes present in pulmonary tissue fractions that are involved in the further metabolism of polycyclic hydrocarbon epoxides have also been measured and the values compared with those obtained with rat liver. When benz(a)anthracene 5,6-oxide was used as substrate, much lower levels of microsomal epoxide hydrase activity were found in lung than in liver, but soluble-supernatant fractions of rat lung appeared to possess higher levels of glutathione S-epoxide transferase activity than were present in rat liver. The significance of these results in relation to the metabolic activation of polycyclic hydrocarbons by epoxide formation and to the induction of tumors of the respiratory tract by members of this class of chemical carcinogen is discussed. (Author abstract)

37402 **APTIC NO. 60026**

Grover, Philip L., Alan Hewer, and Peter Sims

METABOLISM OF POLYCYCLIC HYDROCARBONS BY RAT-LUNG PREPARATIONS. *Biochem. Pharmacol., 23(2):323-332, Jan. 15, 1974. 40 refs.*

The metabolism of benz(a)anthracene, 7-methylbenz(a)anthracene, and benzo(a)pyrene was studied in homogenates and microsomal fractions prepared from rat lungs. The results were compared with those obtained in parallel experiments where rat liver preparations were used; qualitatively, the hydrocarbons were metabolized to similar ethylacetate soluble products by both tissues. Quantitative estimations of the metabolism of the hydrocarbons indicated that rat liver was more active than rat lung when compared on the basis of the weight of tissue involved. Comparisons made on the basis of the protein content of tissue preparations showed, however, that rat lung was at least as active as rat liver in the metabolism of polycyclic hydrocarbons. The metabolites were mainly ring-hydroxylated products; this implies that epoxides were formed from polycyclic hydrocarbons by the enzymes present in rat lungs. (Author abstract)

37403 **APTIC NO. 60022**

Harada, Y., A. Yamada, and E. Tahara

RESULTS OF SCANNING ELECTRON MICROSCOPIC OBSERVATION OF TRACHEO- MUCOSAL IMPAIRMENT BY POISONOUS GASES. *(Yudoku gasu ni yoru kikan nenmaku shogai no sosa denken-teki kansatsu). Text in Japanese. Nihon Jibi Inkoka Gakkai Kaiho (Jap. J. Otorhinolaryngol. Soc.), 77(1):99, Jan. 1974. (Presented at the Japan Otorhinolaryngological Society, 64th Chugoku Local Meeting, Tottori City, July 8, 1973.)*

Scanning electron microscopic observations were carried out on the impaired trachea of mice who experimentally inhaled mustard gas, Luisite, and sulfur dioxide. The first two poisonous gases caused extremely serious impairment of tracheal mucosa, with reduction, fall out, and disappearance of cilia accompanied by intracellular pathological changes. The impairment by inhaling SO2 was not as serious. Some findings which suggest secretion in nonciliated cells were obtained in electron microscopic images. On these cells, many granular secreted substances were observed.

37404 **APTIC NO. 59633**

Higgins, Ian T. T.

TRENDS IN RESPIRATORY CANCER MORTALITY IN THE UNITED STATES AND IN ENGLAND AND WALES. *Arch. Environ. Health, 28(3):121-129, March 1974. 10 refs.*

Trends in respiratory cancer mortality from 1940 to 1969 in the U. S. and in England and Wales are compared. In the U. S., male age-specific death rates increased at a declining rate; female rates increased dramatically since about 1955. In England and Wales, the male rates declined under 55, flattened at ages 55 to 64, and increased only in those aged 65 and over; female rates increased markedly since about 1957. After allowing for cigarette smoking, the effect of air pollution was sought. There was a slightly greater decline in the lung cancer death rates among men aged 25 to 64 and women aged 45 to 54 in Greater London than in the rest of the country. This is in line with the greater decline in smoke pollution in London than elsewhere. (Author abstract)

37405 **APTIC NO. 60256**

Horai, Z. and M. Sugita

THE DEVELOPMENT MECHANISM OF COLLAGEN FIBERS IN PULMONARY FIBROSIS, ESPECIALLY IN THE DISEASE CAUSED BY DUST. *(Haiseni-sho ni okeru kogenseni no hattatsu kiko - tokuni funjin-sei haiseni-sho ni tsuite). Text in Japanese. Kurinika (Clinica), 1(1):31-36, Feb. 1974. 15 refs.*

A suspension of anhydrous silicic acid dust (particle size 1-3 micron) was injected into the lungs of Wistar rats via the trachea. Histopathological specimens were taken by autopsy 2, 4, 8, and 16 wk after injection and examined microscopically. Autoradiography was also carried out. At first, alveolitis occurred and tritiated thymidine labeling indicated that fibroblasts were active in producing non-collagenous protein and acid mucopolysaccharides as well as fibers. Sixteen wk after injection, collagen fibers, and abnormally proliferated components of connective tissue predominated. Microscopic observation after 36 and 48 wk revealed foci of partly atrophied collagen fibers, suggesting the formation of cicatrices. Apparently the fibroblast plays a major role in the formation of collagen fibers in pulmonary fibrosis caused by dust.

37406 **APTIC NO. 60263**

Kamataki, Tetsuya and Haruo Kitagawa

DIPHASIC BINDING OF CARBON MONOXIDE WITH CYTOCHROME P-450 OF RAT LIVER MICROSOMES REDUCED BY NADPH. *Chem. Pharm. Bull., 22(1):171-175, Jan. 1974. 16 refs.*

Periodic change in the binding of carbon monoxide with cytochrome P-450 of rat liver microsomes reduced by the reduced form of the coenzyme nicotinamide adenine dinucleotide phosphate (NADPH) were investigated and found to exhibit a diphasic pattern. Two P-450 species differing either in the affinity to bind with CO or oxygen, or in their steady state, were hypothesized. The former showed a peak at 451 or 452 millimicron when it was reduced and then bound with CO, while the latter exhibited a peak at a wavelength shorter than 450 millimicron. The former also appeared to catalyze the metabolism of compounds such as hexobarbital and aminopyrine, while the latter appeared involved in the oxidation of compounds such as 3-methylcholanthrene.

37407 **APTIC NO. 60264**

Lawther, P. J., A. G. F. Brooks, P. W. Lord, and R. E. Waller

DAY-TO-DAY CHANGES IN VENTILATORY FUNCTION IN RELATION TO THE ENVIRONMENT. PART I. SPIROMETRIC VALUES. *Environ. Res., 7(1):27-40, Feb. 1974. 22 refs.*

Measurements of forced expiratory volume at 1 sec, forced vital capacity, and maximum mid-expiratory flow were made on four normal adults employed in central London on each working day for 5 years. Maximum mid-expiratory flow for three of the subjects was highest on days with low concentrations of smoke and sulfur dioxide, and it decreased with successively higher concentrations. It was not clear, however, whether this was an effect of pollution or other associated factors. Respiratory infections were found to have pronounced effects on these spirometric measurements, and analysis of the results for the complete series revealed small seasonal variations and long-term changes, some of which were large and in the opposite direction from those expected with increasing age. Some immediate but transient effects of pollution on the spirometric values were observed following exercise in periods of high pollution. The role of pollution in affecting the course of respiratory infections and thus indirectly further affecting ventilatory function was also considered. (Author abstract modified)

37408 **APTIC NO. 60265**

Lawther, P. J., A. G. F. Brooks, P. W. Lord, and R. E. Waller

DAY-TO-DAY CHANGES IN VENTILATORY FUNCTION IN RELATION TO THE ENVIRONMENT. PART II. PEAK EXPIRATORY FLOW VALUES. *Environ. Res., 7(1):41-53, Feb. 1974. 11 refs.*

Measurements of peak expiratory flow were made on four normal adults on each working day for 5 yr. Analysis of the results over the whole period showed small seasonal variations for each subject with lower values on the colder, more polluted days in winter; there was no clear relationship between day-to-day changes in peak flow and environmental factors, however. A gradual increase rather than decrease was found during the 5 yr of the study with respect to age. Multiple regression analyses on the combined results for the four subjects showed that after removing the trend with time the environmental factor explaining the largest proportion of residual variance was the concentration of sulfur dioxide. The decrease in peak flow corresponding with a large increase in SO2 concentration, however, was small, and much of the day-to-day variation in peak flow was due to factors other than the concentrations of smoke or SO2, temperature, or relative humidity. Reductions in peak flow were often associated with respiratory infections, and the possibility that pollution had an indirect effect on ventilatory function by affecting the course of respiratory infections was also considered. (Author abstract modified)

37409 **APTIC NO. 59323**

Lebowitz, Michael D., Paul Bendheim, George Cristea, David Markovitz, John Misiaszek, Michael Staniec, and David Van Wyck

THE EFFECT OF AIR POLLUTION AND WEATHER OF LUNG FUNCTION IN EXERCISING CHILDREN AND ADOLESCENTS. *Am. Rev. Respirat. Disease, 109(2):262-273, Feb. 1974. 30 refs.*

Lung functions in children and adolescents were tested under conditions of exercise with exposures to pollution and high temperatures. Variables, such as time of day, smoking, and respiratory medical history, were controlled in the analysis. Exercise alone, in the absence of air pollution and high temperatures, did not influence lung function. Exposures to pollutants of either oxidant or reducing type and to high temperatures produced postexercise decreases in forced vital capacity and 1-second forced expiratory volume in children and adolescents. The decreases were related to the relative levels of pollution and temperature. Longitudinal studies and possibly controlled exposure experiments are needed to confirm and quantify the relationships found in this study. (Author abstract)

37410 **APTIC NO. 59326**

Miller, S. D. and A. Zarkower

EFFECTS OF CARBON DUST INHALATION ON THE CELL-MEDIATED IMMUNE RESPONSE IN MICE. *Infec. Immunity, 9(3):534-539, March 1974. 25 refs.*

The effects of carbon dust inhalation on the bone marrow-derived (B) and thymus-derived (T) lymphocyte populations of spleen and mediastinal lymph node (MLN) cultures were examined. The concanavalin A (Con A)-responsive cell population (T cells) in the spleen was depressed after 7 days of pre-exposure to carbon dust. However, this effect was transient, and after 14, 21, and 28 days of pre-exposure to carbon dust, the Con A-responsive cells exhibited a 30 to 40% enhancement over control group responses. Conversely, Con A-responsive cells in the pooled MLN cultures exhibited depression, ranging from 22 to 33% below control group values, after 7, 14, and 28 days of pre-exposure to carbon dust. The lipopolysaccharide (LPS)-responsive cell population (B cells) in the spleens of carbon-exposed mice did not differ significantly from control group values after all times of pre-exposure. The LPS-responsive cells in the MLN cultures exhibited enhancement, ranging from 49 to 74% above control values, after 14, 21, and 28 days of pre-exposure to carbon dust. The ability of carbon spleen cell cultures from carbon-exposed mice to undergo antigen induced blast transformation after sensitization with Mycobacterium tuberculosis H37Ra was also determined. Mice exposed to carbon dust inhalation 2 wk before and 3 wk after aerosol or subcutaneous immunization exhibited significantly enhanced ratios of transformation upon culture of their spleen lymphocytes with purified protein derivative of tuberculin. (Author abstract)

37411 **APTIC NO. 59628**

Needleman, Herbert L., Isobel Davidson, Edward M. Sewell, and Irving M. Shapiro

SUBCLINICAL LEAD EXPOSURE IN PHILADELPHIA SCHOOLCHILDREN. IDENTIFICATION BY DENTINE LEAD ANALYSIS. *New Engl. J. Med., 290(5):245-248, Jan. 31, 1974. 11 refs.*

Dentine lead levels were measured from shed deciduous teeth of 761 Philadelphia schoolchildren with no prior history of Pb poisoning and residing in two school districts, one considered high risk for Pb exposure and one considered low risk. Black children in public schools from areas of deteriorated housing had marked elevations of dentine Pb (mean of 198 micrograms/g in 174 children), with 20% of the children having levels in the range associated with toxicity. White children from newer housing had the lowest levels (mean of 41.7 micrograms/g in 304 children). A group of white children from intact housing living near and attending school adjacent to a major Pb processor also had elevations of dentine Pb (mean of 136 micrograms/g in 71 determinations). Lead was measured in the interior dust, playground dirt, and gutter dirt from the various areas. Lead exposure as defined by dentine lead levels was more serious and widespread than previously acknowledged and extended to groups other than those traditionally accepted as at risk.

37412 **APTIC NO. 60290**

Ochiai, Ei-Ichiro

ENVIRONMENTAL BIOINORGANIC CHEMISTRY. *J. Chem. Educ., 51(4):235-238, April 1974. 31 refs.*

The effects of inorganic environmental elements such as metallic pollution on various living organisms are reviewed from a bioinorganic chemical viewpoint. Metallic compounds are absorbed into organisms and metabolized in various ways. Many metallic elements are essential components for a variety of functions, such as catalytic sites in enzymes. Metal ions or compounds interact mostly with proteins. Mercury, cadmium, and lead can block the enzymatic activity of the sulfhydral group and can interact with polynucleic acids and some phospholipids. Many effects are brought about by chelation of metal ions and formation of organometallic derivatives; of particular importance are those involving solubility and permeability through biomembranes. Metal ions are often interchangeable, and therefore harmful metals can replace metals which have specific biological functions. Nonmetallic elements and compounds such as carbon dioxide, carbon monoxide, nitrogen, ammonia, oxygen, and sulfur compounds can also cause toxic effects. Most of these inorganic compounds interact with metal ions in enzymes and inhibit the enzymatic activity.

37413 **APTIC NO. 60149**

Pal, Karolyne

TOXIC EFFECTS OF GASES FROM PLASTICS INCINERATION. *(Muanyagok egesgazainak mergezo hatasa). Text in Hungarian. Muanyag Gumi, 11(2):48-52, Feb. 1974. 12 refs.*

Toxicological and general analytical studies on the combustion gases of plastic materials are reviewed. Apart from carbon dioxide, carbon monoxide, and water, plastic materials also produce other, more or less toxic pollutants, such as styrenes, ethylbenzene, ammonia, hydrocyanic acid, formaldehyde, formic acid, phenol, amines, cyanates, and soot, depending on their composition. Formation of hydrochloric acid, of negligible quantity of phosgene, and, at high temperatures, of chlorine from polyvinyl chlori has been observed. According to a standard method developed in West Germany, the pyrolysis gases formed are cooled with air, and then used for inhalation tests with rats. Both the quantity of the sample and of the gas concentration that cause death of 50% of the test animals to be determined. The test is completed with carboxyhemoglobin measurements and lung tissue investigations. With COHb values exceeding 70%, CO is regarded as the causative agent, while COHb values below 70% indicate the action also of other toxic gases.

37414 **APTIC NO. 60146**

Reeves, Andrew L.

ENVIRONMENTAL POLLUTION BY BERYLLIUM. *(Umweltgefaehrdung durch Beryllium). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 24(2):46-56, 1974. 111 refs.*

Contact with, or inhalation of, beryllium compounds can cause dermatitis and acute or chronic berylliosis. In animal experiments, Be inhalation has caused cancer of the lung and bone. However these effects were not seen in humans; there appears to be a species specificity in the carcinogenic action. The mechanism of action of Be on the living organism is not fully understood. Inhibition of enzymes, especially of alkaline phosphatase, and inhibition of intranuclear replication of DNA were observed, but whether or not these are the essential features of Be actions is not known. New results indicate the involvement of autoimmune phenomena in the pathogenesis of berylliosis.

37415 **APTIC NO. 59989**

Sakai, Y.

INVESTIGATION ON THY HEALTH EFFECT OF AIR POLLUTION DUE TO PHOTOCHEMICAL REACTION, PART III. EFFECTS OF PHOTOCHEMICAL SMOG SEEN FROM THE RESULTS OF HEALTH EXAMINATION ON THE NAKANO TELEGRAPH OFFICE CLERKS. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa, 3, Nakano denpo-kyokuin no kenko chosa yori mita kokagaku sumoggu no eikyo ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 27:31-40, Jan. 1974.*

Possible correlations between eye irritation, throat irritation, and odor detection and oxidant concentrations were investigated. Air quality measurements were compared with subjective symptoms recorded by receptionists and telegram delivery boys employed by the Nakano telegraph office. Health data was widely varied and did not necessarily correlate with high values for oxidants.

37416 **APTIC NO. 59990**

Sakai, Y.

INVESTIGATION ON THE HEALTH EFFECT OF AIR POLLUTION DUE TO PHOTOCHEMICAL REACTION, PART IV. RESULTS OF EXAMINATION OF SUBJECTIVE SYMPTOMS CONCERNING AIR POLLUTION, ESPECIALLY ON OCULAR SYMPTOMS. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa, 4, taiki osen ni kansuru jikaku shojo chosa - tokuni gan shojo ni tsuite). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 27:41-47, Jan. 1974.*

Morbidity of ocular and respiratory symptoms of outdoor telephone and telegraph workers was examined. Ocular discomfort was experienced by 31% of the persons studied, and 70% of these symptoms occurred within the past year. No significant variations due to age or district were found. A higher rate of ocular symptoms correlated with persons suffering from chronic respiratory disease. No correlation was found between oxidant concentrations and eye irritation. Other symptoms should be studied, and sampling should include younger subjects.

37417 **APTIC NO. 60000**

Sano, Hiroshi

TOXICITY OF CALCIUM SULFITE WASTE TO FISH. *(Aryusan karushumu haisui no sakana dokusei). Text in Japanese. Mizu Shori Gijutsu (Water Purif. Liq. Wastes Treat.), 15(3):219-222, March 1974. 6 refs.*

The main by-product of lime washing stack gas desulfurization is calcium sulfite, the solubility of which at ordinary temperatures is close to the acute toxicity limit of sulfite. The solubility and toxicity to fish of calcium sulfite has therefore been tested over a large range of pH. The solubility rapidly increased with acidity, but did not change in the alkaliny range. The toxicity of sulfite could not be tested in the pH range 6.5 to 9.0 because the fish ate suspended bits of sulfite, but in the acid range toxicity increased.

37418 **APTIC NO. 59760**

Sayre, James W., Evan Charney, Jaroslav Vostal, and I. Barry Pless

HOUSE AND HAND DUST AS A POTENTIAL SOURCE OF CHILDHOOD LEAD EXPOSURE. *Am. J. Dis. Child., vol. 127:167-170, Feb. 1974. 10 refs.*

Lead dust samples were collected, analyzed, and compared with blood lead levels for children from inner city and suburban households in an attempt to explore the hypothesis that lead dust in inner city homes exists in sufficient quantity to explain higher than normal blood lead levels. The mechanism of poisoning postulated involved contamination of the children s hands by repeated contact with floor, walls, and windowsills in the environment and subsequent ingestion by the typically frequent hand-to-mouth activities of preschool children. Highly significant differences between inner city and suburban values were found for both hand and household specimens. A clear relationship was also evident between individual hand and household levels. The presence of sufficient amounts of lead dust on household surfaces and childrens hands indicated an alternative potential exposure mechanism to the well known pica explanation; although it was not indicated whether the lead came from airborne sources, chalking of paint, or from paint chips shed from walls and perhaps pulverized underfoot.

37419 **APTIC NO. 59349**

Secchi, Gian Carlo, Luigi Erba, and Giovanni Cambiaghi

DELTA-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY OF ERYTHROCYTES AND LIVER TISSUE IN MAN. RELATIONSHIP TO LEAD EXPOSURE. *Arch. Environ. Health, 28(3):130-132, March 1974. 13 refs.*

The delta-aminolevulinic acid dehydratase (ALAD) activity of erythrocytes and of liver tissue was studied via biopsy specimens from subjects not occupationally exposed to lead. A considerable heterogeneity in the levels of ALAD activity of erythrocytes and of blood Pb was confirmed in this group, an expression of the varying degree of absorption of Pb that occurs in each individual who is exposed through pollution of the atmosphere and food. A correlation was found between the values of erythrocyte ALAD activity and the values of ALAD activity liver tissue. (Author abstract modified)

37420 **APTIC NO. 59407**

Shakman, Robert A.

NUTRITIONAL INFLUENCES ON THE TOXICITY OF ENVIRONMENTAL POLLUTANTS. *A REVIEW. Arch. Environ. Health, 28(2):105-113, Feb. 1974. 75 refs.*

A review of the nutritional influences on the toxicity of environmental pollutants is presented. Pollutants of importance in such interactions are various pesticides, a number of minerals, and oxidant air pollutants; nutritional factors of significance include dietary protein, trace minerals, and vitamins A, C, D, and E. Inadequate protein in the diet increases the toxicity of most pesticides, although it decreases or fails to alter the toxicity of a few agents. Dietary carbohydrate is another variable in determining pesticide toxicity, and dietary fat plays a large, direct role in the toxicity of chlorinated hydrocarbons. Food deprivation leads to mobilization of DDT from mammalian fat deposits and produces blood concentrations potentially toxic to the central nervous system. Zinc and cadmium toxicity have been found to be affected by the phytic acid level in the diet, type of dietary protein, dietary calcium, vitamins C and D, iron, and the relative amounts of the metals in the diet. The sulfur-containing amino acid methionine has been found to confer a protective effect against selenium toxicity. Vitamin E deficiency has been shown in rat studies to increase susceptibility to ozone toxicity. Naturally occurring dietary factors that reduce the toxicity of oxidant air pollutants are vitamin E, selenium, and sulfur-containing amino acids.

37421 **APTIC NO. 60121**

Shnaydman, I. M.

PATHOGENESIS OF EXPERIMENTAL SILICOSIS. *(K patogenezu eksperimental nogo silikoza). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 2:52-55, 1974. 18 refs.*

The mechanism of the action of quartz, and the pathogenesis of silicosis were studied electron microscopically and cytochemically in in vitro tests on albino rat peritoneal macrophages taken from the animals 3 days after introduction of highly silicogenic quartz. Following penetration of the cell membrane, accumulation of quartz particles in the phagosome was observed, after which destruction of the phagolysosomal membranes and penetration of the quartz particles into the cytoplasm were observed. Lesions and then total lysis of the mitochondria were also evidenced. Similar changes in neutrophils phagocytizing quartz particles were noted. The findings indicate that silicosis develops in three stages; first, the silanol groups of phagocytized quartz form chemisorptive bonds with protein oxygen and nitrogen as well as with the phospholipids of the biological membranes which leads to structural lesions of the mitochondrial membranes, and to the disintegration of the lysosomal and phagosomal membranes, with the appearance of acid hydrolyses in the cytoplasm as a result. Then, excretion of lysolecithin due to autolysis and phospholipase takes place, whereby the oxygen absorption capacity of the macrophages is reduced. In a third stage, the collagen and mucopolysaccharid formation by the fibroblasts is activized under hypoxic conditions.

37422 **APTIC NO. 59250**

Stara, J. F., M. Moore, and R. Hinners

TOXICOLOGY OF ATMOSPHERIC POLLUTANTS ASSOCIATED WITH THE USE OF AUTOMOBILE CATALYTIC CONVERTERS. *In: Environmental Research In 1973. Annual Report. National Environmental Research Center, Cincinnati, Ohio. Environmental Protection Agency, Cincinnati, Ohio, Office of Research and Development and Environmental Protection Agency, Cincinnati, Ohio, Environmental Toxicology Research Lab., EPA-670/9-74-001, p. 96-99, Feb. 1974.*

Catalytic converters are being studied as controls for reducing gaseous emissions from automobiles to comply with the Clean Air Act. However, these catalytic converters may themselves be sources of further emissions, such as platinum and palladium compounds from the catalysts. Various catalysts were studied to determine the emission of potential toxic pollutants. The converters caused 2.5-3.0 times more particulate matter and increased sulfuric acid particulates. Experimental animals such as rats were exposed to platinum and palladium by oral and intratracheal administration, and the whole body retention times for these metals were determined. The lethal dose of palladium chloride was 5 mg/kg after intravenous dose, 70 mg/kg after peritoneal dose, and more than 200 mg/kg following oral administration. Platinum and palladium caused inhibition of certain enzymes, skin irritation, and neuro-toxic effects. However, in a series of tests of automotive emission studies with catalysts, no significant amounts of platinum or palladium were found in tissues of animals continuously exposed. The toxic effects from the reduced carbon monoxide and hydrocarbon levels were much less than those due to the exhaust emissions of an engine without the converter.

37423 **APTIC NO. 59397**

Todorovic, Pavle

AIR POLLUTION AND TRAFFIC SAFETY. *Experientia Suppl., 20:55-60, 1974. 6 refs.*

Studies were performed on the influence of carbon monoxide and nitrogen oxide concentrations, measured along city streets in Belgrade and inside motor vehicles, on driving capabilities. Quantities of air pollutants found were extremely high, and the evidence indicated that they had a special influence on the psychophysical ability of drivers. Investigations of traffic policemen showed that CO concentrations in the blood of nonsmokers ranged from 0.47-1.2% when CO was found in the amount of 30-40 mg/cu m along Belgrade streets; the concentrations in the blood of smokers ranged from 0.94-2.4%. Carboxyhemoglobin amounted to 3.8-6.2% for nonsmokers and 5.6-8.2% for smokers. Methemoglobin ranged from 1.9-2.7%. Investigations concerning the concentrations inside vehicles revealed that the traffic pollutants actually exceeded the maximum allowed values for working conditions in some cases.

37424 **APTIC NO. 59986**

Umezawa, T.

INVESTIGATION ON THE HEALTH EFFECT OF AIR POLLUTION DUE TO PHOTOCHEMICAL REACTION, PART I. INVESTIGATION ON THE SUBJECTIVE SYMPTOMS OF POLICEMEN IN OUTSIDE DUTY. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa, 1. Gaikin keisatsukan ni tsuiteno jikaku shojo chosa). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 27:1-16, Jan. 1974.*

The relationship between eye and throat irritations and pollutant concentrations was studied by correlating data from air quality monitoring points and the subjective symptoms of outdoor policemen. The rate of complaints of eye discomfort from all traffic and patrol policemen correlated well with high values for dust, sulfur dioxide, carbon monoxide, nitrogen dioxide, and oxidants. Higher temperatures generally paralleled more discomfort, but humidity had the opposite effect. Complaints of cough, sputum, and throat irritation correlated with high values for all the pollutants measured. Temperature had localized effects. Detection of odors correlated well with pollutant values and temperature, but humidity had again an opposite effect. Complaints of eye and throat irritations were higher during photochemical smog episodes in which the oxidant concentration were abnormally high. In some cases, eye irritation seemed to be more acute before the smog episode when the oxidant concentration was rapidly increasing.

37425 **APTIC NO. 60218**

Van As, A. and I. Webster

THE MORPHOLOGY OF MUCUS IN MAMMALIAN PULMONARY AIRWAYS. *Environ. Res., 7(1):1-12, Feb. 1974. 25 refs.*

The morphology of mucus in the trachea of rats exposed for 2 hr to charcoal particles in a dust chamber was studied by light and scanning electron microscopy. A correlation was established between the two methods, and both indicated a discontinuity of mucus and transport in streams in the larger airways of the rat. Detailed examination of thy individual mucus entities largely confirmed the concept that mucus is present as droplets, flakes, and plaques. (Author abstract modified)

37426 **APTIC NO. 59987**

Yokoyama, E. and O. Ichikawa

INVESTIGATION ON THE HEALTH EFFECT OF AIR POLLLUTION DUE TO PHOTOCHEMICAL REACTION, PART II-I. PHOTOCHEMICAL OXIDANT AND THE VENTILATION FUNCTION OF TRAFFIC POLICEMEN. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa, 2-1. Kokagaku okishidanto to kotsu keikan kanki kino). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 27:17-26, Jan. 1974.*

The effects of photochemical oxidants on the pulmonary functions were studied by measuring the forced vital capacity (FVC), forced expiratory volume (FEV), the rate of exhalation at 35% lung capacity (V35), and pulmonary resistance (Rres) of traffic police. The rate of change of the pulmonary function is calculated by subtracting the values obtained before occupational exposure to oxidants from the values present after exposure, and multiplying this number by 100 to obtain a percentage figure. Sampling variations caused considerable error. The data obtained indicated a decrease in FVC in men, especially in smokers, no definite trends in V35, and large variations in Rres. Concentrations of less than 0.075 ppm caused equal increases and decreases of V35, but concentrations above 0.075 ppm caused larger decreases. Concentrations of less than 0.075 ppm caused increases of Rres. The rate of change of V35 was significant at the level of 1%. Conclusions could not be reached.

37427 **APTIC NO. 59988**

Yokoyama, E.

INVESTIGATION ON THE HEALTH EFFECT OF AIR POLLUTION DUE TO PHOTOCHEMICAL REACTION, PART II-II. FURTHER RESULT OF INVESTIGATION ON PHOTOCHEMICAL OXIDANT AND THE VENTILATION FUNCTION OF TRAFFIC POLICEMEN. *(Kokagaku hanno ni yoru taiki osen kenko eikyo chosa, 2-2, Kokagaku okishidanto to kotsu keikan kanki kino(t-suika)). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 27:27-30, Jan. 1974.*

The effect of photochemical oxidants on pulmonary functions were studied by measuring the forced vital capacity (FVC), forced expiratory volume (FEV), the rate of exhalation at 35% lung capacity (V35), and pulmonary resistance (Rres) of traffic police. Values were determined before and after daily occupational exposure. Oxidant concentrations were high and variable, as were values for nitrogen dioxide and sulfur dioxide. The rates of change in pulmonary ventilation functions could be classified into three patterns: increases corresponding to + 10%, no changes within + or 10%, and decreases corresponding to less than - 10%. Increases of + 10% for FVC and FEV occurred only three or four times out of the total 42 determinations. The rate of change of V35 was 36% in the decrease category, 57% in the no change category, and 7% in the increase category. The frequency of change of Rres was 50% in increases, 16% in no changes, and 34% in decreases. The effects of NO2, SO2, and dust are considered.

37428 **APTIC NO. 59374**

World Health Organization, Geneva (Switzerland)

THE LONG-TERM EFFECTS OF AIR POLLUTION ON HEALTH. *World Health Organization Chronicle (Geneva), 28(1):12-15, 1974. 5 refs.*

Epidemiological studies on the health effects of air pollution are reviewed for investigations conducted in Cracow, Poland, the Netherlands, Czechoslovakia, and the United Kingdom. Studies in Cracow investigating the relation between the prevalence of chronic nonspecific respiratory diseases and concentrations of sulfur dioxide and suspended particulates in the air revealed a far greater prevalence among persons living in highly polluted areas, especially if they had smoked for longer than 20 years. Studies on the natural history and pathogenesis of chronic nonspecific lung disease in the Netherlands indicated that the most important factors involved were smoking, area of residence, age, sex, allergy, and bronchial reactivity. Czechoslovakian studies demonstrated that the hemoglobin content of the blood increased significantly when children from highly polluted areas were transferred to areas with clean air; in areas of high sulfur dioxide pollution higher red cell counts were found within an increased hemoglobin content, and the volume of red cells was smaller. A number of field studies of young children in the United Kingdom have shown an association between local levels of air pollution and disorders of the lower respiratory tract. The World Health Organization has agreed upon the following for defining areas of high pollution: a median concentration of 100 micrograms/cu m SO2 and a median standard smoke concentration over 40 micrograms/cu m. An outline was suggested for future epidemiological studies on air pollution health effects.

1973

37429 **APTIC NO. 59549**

Aranyi, Catherine, Michael D. Waters, Donald E. Gardner, and David L. Coffin

METAL TOXICITY FOR RABBIT ALVEOLAR MACROPHAGES IN VITRO. II. EFFECTS ON SURFACE MORPHOLOGY AS DETERMINED BY SCANNING ELECTRON MICROSCOPY. *Preprint, IIT Research Inst., Chicago, Ill., Life Sciences Research Div. and Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 20p., 1973 (?). 18 refs.*

The surface topography of rabbit alveolar macrophages exposed to salts of cadmium, vanadate, nickel, manganese, and chromium in vitro was studied using scanning electron microscopy. Morphological alterations observed correlated well with the cytological and biochemical changes observed in previous experiments with the same compounds. Low concentrations (0.1 mM) of CO and V produced decreases in cell viability as well as extensive structural deterioration. Much higher concentrations (4-6 mM of Ni, Mn, and Cr were required to produce equivalent changes in viability and surface topography. A mode and sequence of cell injury which may ultimately lead to cell death were suggested by correlating the observed surface alterations with exposure concentrations and resultant cell viabilities. (Author abstract modified)

37430 **APTIC NO. 59318**

Beasley, W. H., D. D. Jones, A. Megit, and Sylvia G. Lutkins

BLOOD LEAD LEVELS IN A WELSH RURAL COMMUNITY. *Brit. Med. J. (London), 4(5887):267-270, 1973. 26 refs.*

In a study of the blood lead levels of 626 healthy blood donors no differences were found between men and women, but there was a significant increase with age. Resident donors had a higher blood Pb than students, and the level in residents increased with living in the Aberystwyth area up to about 20 yr.

The levels in the students did not increase with residence in Aberystwyth. No differences were found in the blood Pb of donors living in different wards of Aberystwyth and none between the blood Pb of donors living in the rural area and those in the town. Almost half of the local resident donors had a level above the normal range. (Author abstract)

37431 APTIC NO. 59377

Chang, C. K. and T. G. Traylor

PROXIMAL BASE INFLUENCE ON THE BINDING OF OXYGEN AND CARBON MONOXIDE TO HEME. *J. Am. Chem. Soc., 95(25):8477-8479, Dec. 12, 1973. 19 refs.*

A series of experiments were performed to compare the oxygen and carbon monoxide affinities of heme compounds having either pyridine or imidazole as a fifth ligand. The results indicated that the pyridine ligand, which brought about strong CO binding, was completely ineffective in oxygen binding. Imidazole had an extraordinary ability to favor O_2 over CO, perhaps due to pi basicity (sideways basicity). The unusually large pi basicity of imidazole compared to other pi bases which serve to make the iron back-bond more strongly with the empty electronegative pi orbitals of oxygen also appears important. The results also indicated that factors influencing oxidation and binding are not necessarily the same. The neighboring group effect plus the basic nature of imidazole were important attributes of the myoblogin protein.

37432 APTIC NO. 60267

Chigusa, M. and E. Nakada

GENETIC EFFECTS OF OZONE OF FECUNDITY (NUMBER OF EGGS), HATCHABILITY, EMERGENCE RATE AND LONGEVITY OF DROSOPHILA MELANOGASTER. *(Ozon ni yoru shojo-bae no ideneki eikyo ni tsuite). Text in Japanese. Tokyo Toritsu Eisei Kenkyusho Nenpo (Annu. Rept. Tokyo-to Lab. Med. Sci.), no. 24:331-335, Dec. 1973. 10 refs.*

Male and virgin female Drosophila melanogaster (wild type) were exposed to 10 or 27 ppm ozone for 1-3 hr/day on 4 consecutive days and mated to each other or to non-exposed control flies. The experimental matings yielded less eggs than the controls. This is attributed to lowered mating ability of exposed flies. The hatching ratio was also less, suggesting the occurrence of lethal mutations or physiological alterations. The emergence ratio was the same as control, suggesting that there are no effects of O_3 on this stage. When both parents or the female parent were exposed to 27 ppm O_3, the longevity of the offspring was significantly less than that of control matings. In the case of the male progeny, this effect could be due to mutations induced in the maternal X chromosome, which they carry hemizygously.

37433 APTIC NO. 59925

Colucci, Anthony V., Dennis Winge, and James Krasno

CADMIUM ACCUMULATION IN RAT LIVER: CORRELATION BETWEEN BOUND METAL AND PATHOLOGY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab.. and Duke Univ., Durham, N. C., Dept. of Biochemistry, 23p., 1973 (?). 18 refs.*

Biochemical and pathological studies of rats injected with cadmium ranging from 0-4.0 mg/kg body weight indicated the existence of a critical threshold level of toxocity for the metal. Administration of cadmium to the rats caused the innduction of liver metallothionein through which the metal was chelated in the cellular supernatant. The critical determining factor of toxicity appeared to be tissue concentration rather than injection dose; when the hepatic Cd level was below 30 micrograms/g liver wet weight, the metal was sequestered as metallothionein with no evidence of toxicity. Hepatic concentrations of 40 micrograms Cd/g liver resulted in cellular degeneration which did not follow any zonal pattern characteristic in many other toxic conditions. The metal was bound solely to metallothionein at low injection levels of cadmium (0.5-1.0 mg Cd/kg).

37434 APTIC NO. 59420

Corrie, Anna M., Murray L. D. Touche, and David R. Williams

THERMODYNAMIC CONSIDERATIONS IN CO-ORDINATION. PART XIV. FORMATION CONSTANTS FOR LEAD (II)-AMINO-ACID COMPLEXES AND THEIR USE IN COMPUTING THE COMPLEXING COMPETITION BETWEEN LEAD (II) AND IN VIVO ESSENTIAL METAL IONS, AND IN COMPUTER EVALUATION OF LIGANDS CURRENTLY EMPLOYED AS LEAD (II) CHELATING THERAPEUTICALS. *J. Chem. Soc., no. 23:2561-2565, 1973. 16 refs.*

The formation constants between lead (II) and representative amino acid anions were measured and the metal ion s binding potential was compared with those for the in vivo essential transition metal ions. Potentiometrically determined formation constants are reported for the Pb asparaginate, aspartate, cysteinate, glutaminate, histidinate, phenylalanate, serinate, and trptophanate systems at 25 deg, I equals 3.00 M (Na(+))ClO4(-). Computer simulated models of blood plasma conditions were used to examine the complexing competition between Pb and manganese (II), iron (II), cobalt (II), copper (II), and zinc (II)-amine- acid anion complexes and to assess the selectivities of ethylenediaminetetraacetic acid and D-penicillamine for Pb and the in vivo essential amino acids listed. Lead complexes the cysteinate ligand at the expense of the Zn-cysteinate system and then produces increased concentrations of other Zn complexes; and more specific drugs may be synthesized as peptides derived from L-cysteine, histidien, and aspartic acid. (Author abstract modified)

37435 APTIC NO. 59302

Cotes, J. E., J. M. Dabbs, A. M. Hall, A. T. Axford, and K. M. Laurence

LUNG VOLUMES, VENTILATORY CAPACITY, AND TRANSFER FACTOR IN HEALTHY BRITISH BOY AND GIRL TWINS. *Thorax, 28(6):709-715, Nov. 1973. 20 refs.*

Normal values are reported for the lung volumes, ventilatory capacity, and transfer factor of 212 healthy British twin children aged 8-16 years. The boys and girls share a common relationship to height for the residual volume, peak expiratory flow rate, and KCO (transfer factor per litre of lung volume). For the inspiratory capacity and the transfer factor, also its membrane component (Dm), the values for the boys exceed those for the girls by, on average, 10%. This difference may be due, at least in part, to the boys taking more exercise. (Author abstract)

37436 APTIC NO. 59410

Harris, Curtis, C., David G. Kaufman, Michael B. Sporn, Hollis Boren, Frank Jackson, Joseph M. Smith, Judith Pauley, Paul Dedick, and Umberto Saffioti

LOCALIZATION OF BENZO(A)PYRENE-3H AND ALTERATIONS IN NUCLEAR CHROMATIN CAUSED BY BENZO(A)PYRENE-FERRIC OXIDE IN THE HAMSTER RESPIRATORY EPITHELIUM. *Cancer Res., vol. 33:2842-2848, Nov. 1973. 27 refs.*

The intratracheal instillation of benzo(a)pyrene (BP-ferric oxide in the Syrian golden hamster caused a number of changes in nuclear structure. A selective increase in the cross-sectional area of nuclei of basal cells was observed in multiple focal areas in the tracheal epithelium. This increase represented an enlargement in the cross-sectional area of euchromatin and a dispersion of the heterochromatin. In short-term organ culture of tracheas, incubation with tritiated BP caused labeling of nuclear and cytoplasmic sites in mucous, basal, and ciliated cells. Quantitative light microscopic autoradiography revealed that prior in vivo administration of unlabeled BP caused a subsequent increase in the in vitro binding of BP-3H to epithelial cells. The total binding of BP-3H to epithelial cells was inhibited either by the addition of 7,8-benzoflavone to the incubation medium or by incubation at 0 degrees. Enzymatic activation of BP must occur before BP can be bound. The nuclear localization of BP-3H was primarily in the heterochromatin, as determined by electron microscopic autoradiography. (Author abstract)

37437 **APTIC NO. 59545**

Hart, Richard A.

THE SOUTH WIND MYSTERY. *Preprint, Northwest Missouri State Univ., Maryville, Mo., 6p., Oct. 1973.*

Studies on allergenic effects experienced by humans and 2,4-D effects observed on redbuds, both apparently related to certain south winds, are reported for the northwest section of Missouri. Observations of the 2,4-D effect which resulted in leaf injury suggested the following possible sources: aircraft spraying; fumigation from the cumulative drift of all spraying and lawn fertilizer-containing herbicides; or the revolatilization of herbicides during the south wind weather event where the temperature and humidity rise rapidly. Ozone observations suggested the following hypotheses: excess ozone production is uniform in the plume leaving the large cities in the area, or hydrocarbons and nitrogen oxides are released by anaerobic soil bacteria in sufficient quantities to provide a general uniform production of ozone. The allergens peculair to the south winds are still unknown.

37438 **APTIC NO. 59424**

Hirai, Kunio, Mitsuo Tokuda, Takeshi Yamanaka, Kenji Kawamoto, and Shoji Yamamoto

ON THE AIR POLLUTION BY THE FILTER PAPER METHOD AND PUBLIC HEALTH INVESTIGATION IN OTSU CITY. *(Otsu-shi ni okeru arukari roshiho ni yoru taiki osen narabi ni jumin no kenko chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):489, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 221.)*

Epidemiological investigations of sulfur oxides measurements, nitrogen oxides measurements, and the health of residents were made in Otsu. The pollutant measurements were taken at 53 locations. Of the six-month measurement averages between Sept. 1972 and Feb. 1973, the maximum for SOx was 0.33 mg/day/100 sq cm and the minimum was 0.02 mg/day/100 sq cm. The maximum for NOx measurement averages was 0.117 mg/day/100 sq cm and the minimum was 0.008 mg/day/100 sq cm. Residential area averages were relatively low and the commercial area averages were relatively high. The health of the residents was studied by questionnaires and interviews. The health history on tuberculosis, bronchial asthma, chronic bronchitis, allergic rash, shingles, cough, sputum, headache, eye irritation, lachrymation, eye secretion, and throat pain were investigated. In polluted areas, only 35% of the residents were satisfied with the environment, compared with 80% of relatively unpolluted area. The majority of people felt that automotive emissions were the major pollutants. In the same polluted area, 33.7% had a history of allergic rash, 35.9%, frequent colds, 8.4% frequent headaches, high rates of sputum, and there was a high rate of coughs among older people.

37439 **APTIC NO. 60252**

Hiraoka, E. and T. Akabane

A STUDY ON THE RESPIRATORY SYMPTOMS OF SCHOOLCHILDREN IN OMACHI, KITA-AZUMI DISTRICT, NAGANO PREFECTURE. *(Naganoken Omachi, Kita azumi chiho ni okeru gakudo no kokyuki shojo ni kansuru kenkyu). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 3(10):20, Oct. 1973.*

The respiratory systems of primary schoolchildren in Omachi-Kita- Azumi district, Nagano Prefecture were examined over a 3-month period in 1972. Previous x-ray examination for tuberculosis had turned up a high frequency of bronchitic symptoms in the three schools that were investigated. The examination consisted of questionnaires, Baiterar lung function tests, chest x-rays, and detailed examination of screened children. Incidence of frequent cough was higher (22.6%) in one school than in the other two (11.9%). The frequency of stridor and asthma-like fit was the same overall (7 to 10%). The frequency of complaints of dense pituita, occasional headache, occasional nausea, occasional ocular ache, and eczema were 7%, 32.2%, 17.9%, 11%, and 11.6% respectively for one school, and 4.7%, 19.7%, 12.9%, 5.2%, and 6.9% respectively for the other two schools. The cause of these symptoms was probably smoke from nearby factories.

37440 **APTIC NO. 59277**

Hori, Norio

ON CHORDITIS NODOSA OF SCHOOLCHILDREN IN MIZUSHIMA. *(Kurashiki-shi Mizushima chiku gakudo ni tahatsushita kessetsusei seitaien). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):484, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 216.)*

Based on the results of questionnaires given to children in Kurashiki elementary schools in December 1971 and June 1972, 458 children of the Mizushima District were given examinations of pharynx and 117 were found to have chronic pharyngitis. Because of the notable increase of children with complaints for hoarseness, the vocal cords of the children of the Mizishima District were examined and compared with the children of schools in unpolluted area. In the four elementary schools of the polluted area, 236 out of 3172 had hoarse voices and 67 vocal nodules (choriditis nodesa). The morbidities in these schools ranged between 1 and 2.9%. In one control school, 2 out of 241 children were hoarse but none had vocal nodules. In the school with 2.9% morbidity, out of 595 children, 51 had chronic rhinitis; 10 had chronic inflammation of nasal cavity; 9 had allergic rhinitis; 6 had chronic tonsilitis; 24 had enlarged tonsils; 61 had chronic pharyngitis; 60 had chronic laryngitis, and 17 vocal nodules.

37441 **APTIC NO. 59287**

Ichikawa, Isamu and Eiji Yokoyama

EFFECT OF OZONE ON RAT LUNG PHOSPHOLIPIDA. *(Ratto hai rinshishitsu ni taisuru O3 no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):491, Oct. 1973. 8 refs. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 223.)*

The effect of ozone on the resiliency of the lung phospholipids has been reported by various scientists. Here, the mechanism and lipid metabolism changes as to effects of O3 exposure were examined by experimental exposures of rats to O3. After exposing nine week-old rats and six month-old rats to 1 ppm of O3 for 3 hr, the rats were killed, the lungs dissected, and the lipids taken out by the Folch method. The lipids from the airway were also extracted. The quantity of phospholipids were measured by the King method. Intake tests were given to lung tissues using radioactive phosphoric acid, palmitic acid, linoleic acid, and glycerol-3H. With the nine week-old rat group, there was a slight decrease of intake with the exposed group, though not significant.

37442 **APTIC NO. 59957**

Kagawa, J. and T. Toyama

STUDIES ON THE INFLUENCE OF OXIDANT TO HUMAN BODY, PART II. THE EFFECTS OF INHALATION OF OZONE AND OF MOVEMENT ON AIRWAY RESISTANCE. *(Okishidanto no jintai eikyo ni kansuru kenkyu -dai 2ho, ozon kyunyu to undo no kido* *taiko ni oyobosu eikyo). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 26:89-91, Nov. 1973. 3 refs.*

The effect of exercise on the changes in pulmonary resistance caused by inhalation of ozone is studied. Inhalation of ozone increases pulmonary resistance, and in a normal body, exercise causes dilation of the airway and decreases pulmonary resistance. Healthy subjects inhaled 0.9 + or 0.02 ppm ozone and rode a bicycle at 50 rpm. Effects were measured with a plethysmograph and an ergometer. Inhalation of 0.9 ppm ozone with light exercise of short duration did not affect bronchial stenosis.

37443 **APTIC NO. 60192**

Kitabatake, M., K. Yoshida, and M. Imai

ON THE EFFECTS OF SO2, NO2 AND O3 TO EXPERIMENTAL ASTHMA OF GUINEA PIG. *(Morumotto no jikken zensoku ni oyobosu SO2, NO2, O3 no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):428, Oct. 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Four groups of guinea pigs were exposed to 5.6 ppm sulfur dioxide, 5.6 ppm nitrogen dioxide, and 4.9 ppm ozone for 30 min twice a week. Experimental and control animals were sensitized by inhaling albumin for 30 min, and then the exposure procedure was repeated twice weekly. Respiratory rates were measured by plethysmograph during exposure to the pollutants and the antigen and the change of respiratory symptoms were calculated, based on the measurement of dyspnea. Increases in exposure times increased the dyspnea, especially for O3. To examine the change in the respiratory curve by sensitization by the antigen, the average value of the respiratory curve was calculated after every exposure.

37444 **APTIC NO. 60189**

Kusumoto, S., H. Oda, Y. Tsubota, E. Yonekawa, T. Nakajima, and M. Kubo

INFLUENCE OF ACUTE EXPOSURE TO PHOTOCHEMICAL OXIDANT ON BLOOD CELLS OF MICE. *(Kokagaku okishidanto kyusei bakuro no mausu kekkyu ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):430, Oct. 1973. 1 ref. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The relationships between acute exposure to ozone, oxidants, and exercise on the White Blood Count (WBC) were studied. Mice were exposed to ozone at 1.2 and 3 ppm and oxidants at 0.6-0.8 ppm, and automotive exhausts under conditions of rest and forced activity. Blood was collected directly after and 5 hr after exposure and the WBC and total hemoglobin concentrations were determined. The WBC increased progressively at each concentration, with a significant jump at 3 ppm. The WBC increased significantly in two of seven exposures to oxidants, but testing procedures may have caused errors. Exhaust gases did not affect the WBC. Exercise decreased the WBC.

37445 **APTIC NO. 59393**

Linden, W. E. Van Der and C. Beers

DETERMINATION OF THE COMPOSITION AND THE STABILITY CONSTANTS OF COMPLEXES OF MERCURY (II) WITH AMINO ACIDS. *Anal. Chim. Acta, 68(1):143-154, Jan. 1973. 9 refs.*

The complex formation of mercury (II) with 20 of the most important amino acids was investigated, and the corresponding stability constants were recorded. Calculations were based on simultaneous pH and pM measurements of solutions containing the amino acid in excess with respect to Hg. Most amino acids were found to form mononuclear monoligand complexes as well as mononuclear biligand complexes. A different behavior was observed for histidine and methionine, for which the complexes became strongly protonated at lower pH values. (Author summary modified)

37446 **APTIC NO. 59531**

Marshall, William F. and R. W. Hurn

HAZARD FROM ENGINES REBREATHING EXHAUST IN CONFINED SPACE. *Bureau of Mines, Bartlesville, Okla., RI 7757, 20p., 1973. 1 ref.*

The influence of exhaust rebreathing on emissions from various gasoline and diesel engines was investigated. Tests were conducted that simulated operation of engines in nonventilated spaces as well as in spaces with partially restricted ventilation. Exhaust rebreathing can have a marked effect on exhaust emissions and thus on the composition of the air in the working space. For the case of restricted ventilation, unacceptably high (greater than 50 ppm) levels of carbon monoxide in the air of the working space resulted from exhaust. In a nonventilated space, in highly critical CO levels at times corresponding to 1-3 lbs of fuel consumed per 1000 cu ft of space resulted. Tests involving spaces of various sizes showed that volume of the air space per se is not important, the primary variable is fuel consumed per unit volume of air space. (Author abstract modified)

37447 **APTIC NO. 59432**

Nakajima, Toshio and Hideo Tabuki

RESPIRATORY EFFECTS OF AIR POLLUTION IN TSUKUMI CITY. *(Tsukumi- shi ni okeru osen no kenko ni oyobosu eikyo ni tsuite no ekigakuteki chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):475, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 207.)*

The amount of dusts in Tsukumi, where limestone is dug out for cement manufacturing is extremely high and the entire city is covered with white dust. In 1970, the monthly dust fall was 51.02 tons/sq km, with the maximum monthly average being 91.62 tons in May. The average in 1971 was 22.82 tons, with the maximum count of 45.52 tons in August; in 1972, the annual average was 21.69 tons and the maximum record was 52.65 tons in July. With this decreasing tendency, still the environmental quality is still far below the standards. Suspended particulate concentration was 0.198 mg/cu m in 1971 and 0.159 mg/cu m in 1972; the sulfur oxides annual average was 0.44 mg/SO3 in 1972. A questionnaire on health was given to 834 residents of polluted areas and 293 residents in the control areas. The rate of complaints was high among males and old people; 36% of the residents from the polluted area complained of frequent cough and sputum, as compared to 11.6% of the control area, and 17.1% complained of the palpitations and chest pain as against 8.9% of the control area. The morbidity rates in the polluted area and the control area were: tuberculosis (in the recent five years), 2.3% and 1%; bronchitis, 10% and 3.4%; and silicosis, 0.1% and 0.3%, respectively. Of the 226 persons who required an x-ray examination, 119 responded and 43 had symptoms, of which 31 were tubercular. In the control area, 35 required the x-ray and 15 responded; only 3 showed symptoms and 1 was found to be tubercular. Thorough respiratory and pulmonary examinations showed 39 cases in the polluted area and 9 in the control area with some form of damages in the lung functions.

37448 **APTIC NO. 59688**

Newill, Vaun A. and Jean D. French

HEALTH RATIONALE FOR STRICT CONTROL OF SULFUR OXIDE EMISSIONS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73- 038, p. 1-12. (May 14-17.)*

Epidemiological studies and laboratory experiments on the health effects of sulfur dioxide, particulates, and suspended sulfates are reviewed in an attempt to show the need for strict control of sulfur oxide emissions. Significant and consistent excess bronchitis morbidity has occurred over an exposure range of 100-350 micrograms/cu m SO2 with associated suspended particulate levels of 66-365 micrograms/cu m. A remarkably consistent excess of acute respiratory disease ranging from 14-64% was found in children exposed to SO2 levels of 50-275 micrograms/ cu m, and these findings pertained largely to children who had lived in polluted areas for 3 years or longer, suggesting a chronic alteration in their defense mechanisms. Aggravation of symptoms in diseased subjects such as asthmatics and cardiopulmonary subjects have been repeatedly demonstrated at daily SO2 levels well below the indicated threshold for excess mortality, although some studies have demonstrated illness aggravation to be most strongly related to suspended sulfates. Animal studies have indicated that metallic sulfates exert adverse biological effects at concentrations below those of SO2. Adverse health consequences ranging from functional changes preceding disease to death itself have been associated with SO2 exposures in the range of 80-120 micrograms/cu m for one or more days; and, even in communities where national primary standards for SO2 have been achieved, daily sulfate levels in the range of 7-14 micrograms/cu m have been associated with aggravation of symptoms in particularly vulnerable population groups.

37449 **APTIC NO. 60188**

Oda, H., S. Kusumoto, and T. Nakajima

ON THE FORMATION OF NO-HEMOGLOBIN IN ANIMALS EXPOSED TO NO GAS. *(NO gasu bakuro dobutsu no NO hemogurobin seisei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):429, Oct. 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Mice were exposed to (+ or - 10%) 10.5 ppm nitric oxide for 60 min and blood was collected every 10 min. After exposure to NO the animals were put into a clean room and blood collection was continued for 30 min. The concentration of NO was determined by electron spin resonance. The amount of NO-hemoglobin in the blood increased with time of exposure, and attained a plateau after 20 min. The NO-hemoglobin rapidly decreased in the clean room and dropped to zero after 30 min. Successive experiments with concentrations of 2 and 6 ppm NO produced a plateau dependent upon the concentration of NO inhaled.

37450 **APTIC NO. 60020**

Pfeiffer, E. H.

INVESTIGATIONS ON THE CARCINOGENIC BURDEN BY AIR POLLUTION IN MAN. VII. STUDIES ON THE ONCOGENETIC INTERACTION OF POLYCYCLIC AROMATIC HYDROCARBONS. *Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig., 158(1):69-83, 1973. 18 refs.*

Six different doses of benzo(a)pyrene (3-100 micrograms) and dibenz(a,h)anthracene (2-75 micrograms) and mixtures thereof were tested on female NMRI-mice. Mixtures of 10 noncarcinogenic hydrocarbons were also tested: benzo(e)pyrene, benz(a)anthracene, phenanthrene, anthracene, pyrene, fluoranthrene, chrysene, perylene, benzo(g,h,i)perylene, and coronene. In addition, mixtures of all 12 polycyclics were applied. Small doses of dibenz(a,h)anthracene have a stronger tumor-forming effect than comparable doses of benzo(a)pyrene, but as the dose increases the effect of benzo(a)pyrene increases more rapidly than that of dibenz(a,h)anthracene. Small doses of benzo(a)pyrene dibenz(a,h)anthracene mixtures yield higher tumor rates than those yielded by either substance alone. High doses of the mixture yield rates intermediate to those yielded by either substance alone. The 10 noncarcinogenic hydrocarbons tested do not produce tumors at the dosages used. Neither do they affect the two carcinogens when applied together with them.

37451 **APTIC NO. 60245**

Pott, F., R. Tomingas, and F. J. Reiffer

EXPERIMENTAL STUDIES OF THE CARCINOGENICITY AND THE RETENTION OF BENZO(A)PYRENE IN APPLICATION REGION AFTER INTRATRACHEAL AND SUBCUTANEOUS INJECTION. *(Experimentelle Untersuchungen zur kanzerogenen Wirkung und Retention von Benzo(a)pyren am Applikationsort nach intratrachealer und subkutaner Injektion). Text in German. Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig., 158(2):97-108, 1973. 22 refs.*

Three groups of hamsters were injected with 15 mg benzo(a)pyrene intratracheally. One group received the dose in tricarpylin, the second in saline suspension with 2% Tween 60, and the third in saline suspension with 2% Tween 60 plus 38 mg atmospheric dust. Tumors developed in the respiratory tract in 2 animals of the first group, 14 of the second, and 16 of the third. Since the dose had been divided into 45 doses of 340 micrograms BaP, the low tumor rate caused by BaP in tricarpylin can be explained by rapid elimination of BaP from the lung. After intratracheal injection of 2000 micrograms of BaP dissolved in tricarpylin, only 1.3% of hamsters and 0.8% of rats showed tumors in the lung or trachea. Using saline as carrier, the values were 32.5% in hamsters and 63% in rats. Dose-response relations of BaP were investigated in NMRI-mice after a single subcutaneous injection of 25, 50, 100, and 200 micrograms BaP in 0.5 ml tricarpylin and 100, 200, 400, and 800 micrograms BaP in saline. The tumor rate caused by 25 micrograms BaP in tricarpylin was similar to that of 800 micrograms BaP in saline. Large differences in the retention of BaP in the application region were dependent on the carrier liquid, with tricarpylin giving much higher retention than saline.

37452 **APTIC NO. 60139**

Robock, Klaus and Werner Klosterkoetter

STUDIES ON THE SPECIFIC TOXICITY OF VARIOUS SILICA AND SILICATE DUSTS. *(Untersuchungen ueber die spezifische Schaedlichkeit verschiedener SiO2O und Silikatstaeube). Text in German. Staub, Reinhaltung Luft, 33(2):60-63, Feb. 1973. 14 refs.*

The silicogenic effects and the cytotoxicity of different types of dusts with different quartz content and with different pretreatments were studied in guinea pig peritoneal macrophages by the measurement of the 2,3,5-triphenyltetrazolium chloride (TTC) reducing activity and the oxygen consumption of the cells. Treatment of the quartz with phosphoric acid resulted in a reduction by 80% of the cytotoxicity despite 10% increase in the quartz content. Similar effect of heat treatment at temperatures over 600 C was noted. A comparative investigation of three different quartz dusts, obtained by short-term impacts, static pressure, and friction, revealed that the quartz dust obtained by friction was most cytotoxic despite its quartz content being the lowest. The findings show that the quartz content alone does not suffice to characterize the dusts regarding their toxicity. The type and extent of the incorporation of foreign ions in the lattice, as well as thermal, mechanical, and chemical treatments can essentially influence the specific toxicity of SiO2 dusts. Based on the electron theory of catalysis, the electron structure of the dusts is considered the property determining its specific toxicity.

37453 **APTIC NO. 59337**

Rosenfeld, Leonard M. and Domenic A. DeBias

SERUM PROFILE OF MYOCARDIAL ENZYMES DURING CHRONIC EXPOSURE TO LOW LEVELS OF CARBON MONOXIDE. *Proc. Acad. Sci., vol. 47:73-76, 1973. 23 refs.*

Carbon monoxide is one of the major sources of urban air pollution. Since exposure to CO converts hemoglobin to carboxyhemoglobin, thereby reducing the oxygen-carrying capacity of the blood and placing an additional strain upon the cardiovascular system to maintain adequate tissue oxygenation, this present investigation was undertaken to ascertain the effects of chronic exposure (up to 6 mo) to relatively low levels of CO (50-150 ppm) of dogs with prior myocardial infarction. Serum profiles of enzymes of the myocardium (CPK, GOT, LDH) throughout the 6-mo exposure period failed to provide evidence of secondary myocardial infarction. (Author abstract)

37454 **APTIC NO. 59372**

Saito, Kazuo, Toshio Sato, Yuji Sato, and Kozo Niizuma

EFFECT OF LOW LEAD CONCENTRATION ON HUMAN BODY. *Ind. Health (Japan), 11(3):85-93, Sept. 1973. 17 refs. (Presented at the Japanese Society of Public Health, Annual Meeting, 31st, Sapporo, Japan, Oct. 25-27, 1972.)*

The effect of low lead concentrations on the human body was studied by measuring specific gravity of the whole blood, microhematocrit and lead content in the blood, and delta aminolevulinic acid dehydratase (ALAD) activity in erythrocytes for 203 traffic policemen and 19 lead workers. Significant differences among various Japanese cities were noted for specific gravity and lead concentration, with higher blood lead concentrations appearing in developed cities as opposed to undeveloped ones having less roads and no airport. Correlations between ALAD activity in erythrocytes and lead concentration in the blood were observed for both occupational groups, except for samples of blood for traffic policemen which contained less than 15.0 Pb/100 ml blood. Blood lead concentrations and ALAD activity of lead workers were significantly higher than those for the traffic policemen.

37455 **APTIC NO. 60273**

Sato, M. and Y. Tsuji

INFLUENCE OF AIR POLLUTION ON THE HEALTH OF INHABITANTS IN ONAHAMA AREA OF IWAKI CITY. *(Iwaki-shi Onahama chiku taiki osen ga jumin on kenko no oyobosu eikyo). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 3(10):21, Oct. 1973.*

An investigation of the respiratory symptoms of housewives in their forties and fifties on the Onahama area was made by questionnaire. The region was divided into seven areas for each of which the sulfur oxides and dust contents were measured. An attempt was made to correlate the morbidity of respiratory diseases with the concentration of pollutants in each area. Although no statistically significant differences were found, the morbidity does seem to parallel the air pollution.

37456 **APTIC NO. 59399**

Schaplowsky, A. F., R. Baloh, and B. G. King

UNDUE LEAD ABSORPTION. Pub. Health Rev., 2(3):267-288, Aug. 1973. 85 refs.

The effects of increased lead absorption and retention on human health are reviewed along with prevention, control measures, and socio-economic implications. Presently, with the exception of small children in deprived areas where Pb-based paint is common, there is no evidence that any population group has a mean blood Pb level that approaches the dangerous level. The following occupations, however, have a potential risk of undue exposure to Pb: printers, storage battery manufacturing employees, welders and cutters of steel, garage mechanics, service-station attendants, vehicle tunnel attendants, firemen, taxi drivers, and policemen. The major effects of clinical Pb poisoning are shown in the central nervous system, the gastrointestinal system, the hematopoietic system, and the kidneys. Numerous chronic diseases in adults which have been etiologically linked to increased Pb absorption include: hypertension, cerebral vascular disease, arteriosclerosis, multiple sclerosis, motor neuron disease, and chronic renal disease.

37457 **APTIC NO. 60083**

Schmidt, K. G., D. Schmaehl and J. Misfeld

INVESTIGATIONS ON THE CARCINOGENIC BURDEN BY AIR POLLUTION IN MAN. VI. EXPERIMENTAL INVESTIGATIONS TO DETERMINE A DOSE-RESPONSE RELATIONSHIP AND TO ESTIMATE A THRESHOLD DOSE OF BENZO(A)PYRENE IN THE SKIN OF TWO DIFFERENT MOUSE STRAINS. *Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig., 158(1):62-68, 1973. 18 refs.*

Two different mouse strains (NMRI-mice and Swiss-mice) received lifetime application of benzo(a)pyrene applied twice weekly to the shorn skin of the back in single dosages of 0.05, 0.2, 0.8, and 2.0 micrograms. The dose-response relationship assessed shows that single dosages of 1.7 and 1.2 micrograms BP applied twice weekly in the NMRI and Swiss-mice respectively leads to malignomas at the site of application in 20% of the animals. Differences between the two mouse strains were only seen in the sensitivity against the effect of BP, by which the relative efficacy in the Swiss-mice was increased by a factor of 1.4. (Author abstract)

37458 **APTIC NO. 59953**

Slojewska, Krystyna

BERYLLIOSIS. *(Beryloza). Text in Polish. Polski Tygod. Lekar., 28(7):263-266, Feb. 12, 1973. 28 refs.*

A study is presented of the danger of berylliosis, based on literature and clincial findings; diagnostic and treatment methods are discussed. Beryllium is used in lamp and bulb industry, aricraft and rocket industry, and power plants, and in the mining industry. The workers employed in these industries, as well as their families who live in the polluted atmosphere or who come in contact with the workers clothing are exposed to the noxious effects of beryllium compounds. The allowed beryllium concentrations are 10 ng/cu m in the atmospheric air, 1 to 2 micrograms/cu m/8 hr exposure, and 25 micrograms/cu m for short exposures. Beryllium is toxic both in its pure form and in its compounds. The fatal dose for 50% mice population for beryllium sulfate is 0.5 mg/kg of body weight. The first berylliosis cases were discovered and described in the thirties in Germany. Subsequent experiments on animals indicated that beryllium leads to local granular changes, affects enzymatic systems, and causes carcinoma in animals. Clinical observations indicated that berylliosis is characterized by changes on the skin, the eye protective apparatus, and the respiratory system, depending upon the type of contact with beryllium and its compounds. Acute lungs berylliosis is characterized by strong coughing, shortness of breath, pain in the chest, fever, loss of appetite, and loss of body weight. Chronic berylliosis appears after a 2-year exposure to beryllium and its compounds. Sometimes it may appear after less than 6 hr exposure. This type of berylliosis may develop symptoms years after exposure to beryllium has ceased. Berylliosis can be diagnosed on the basis of x-rays, functional changes in the lungs, anatomo-pathological changes in the lungs, anatomic and functional changes in other organs, and the presence of beryllium in tissues and/or in the urine. The patch, sarcoidosis, and Kveim s tests were considered insufficient. Treatment is based on giving ACTH and hormones, and it should be continuous, since interruption causes acute regression. Newer methods of beryllium determination have come into use: the spectrographic, fluorometric, and colorimetric methods. The first is the most accurate, giving readings up to 0.0005 micrograms. The latter methods are used to determine beryllium concentrations in the air.

37459 **APTIC NO. 60160**

Tateda, Kyoichi

ENVIRONMENTAL POLLUTION AND THE HEALTH MEASURES FOR SCHOOLCHILDREN- -QUESTIONS FOR PROFESSOR KATSUMI YOSHIDA S ESSAY. *(Kankyo osen to gakudo hoken e no taisaku ni tsuite--Yoshida Katsumi Kyoju no ronbun ni taisuru gigi). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 32(2):89-92, 1973. 7 refs.*

Some questions are raised on the proposals mace in a previously published article on the health of schoolchildren in polluted areas. The article had advocated physical fitness programs for schoolchildren, regular school sessions in camp environment, specialist examinations and consultations, and installations of pollution control equipment and facilities in the school environment. The advisability of applying physical fitness programs to all the children of different sensitivities and physical conditions, of leaving matters of legislature to the government administration, of trying to promote disease control measures only, of treating the children with chronic respiratory symptoms as nonpatients, of installing air cleaners in the classrooms of polluted area as a solution, and of subjecting the children under asthmatic medication to programs for normal, healthy children, are questioned.

37460 **APTIC NO. 59319**

Tomingas, Von R., F. Pott, and W. Dehnen

BIOLOGICAL TEST FOR CANCEROGENCITY OF POLYCYCLIC AROMATIC HYDROCARBONS. *(Biologische Testmodelle fuer die kanzerogene Wirkung von Polyaromaten). Text in German. Arch. Geschwulstforsch., 42(4):298-306, 1973. 10 refs.*

Because of the great expense involved, inhalation experiments are not suitable for testing the carcinogenicity of dusts. The tumor yield in animals depends strongly on the retention time of the carcinogens in the region of application. The elimination of benzpyrene from the lungs is decreased after preceding injury with quartz dust or ozone. Extracts of airborne dusts of three towns yield a lower tumor rate than the same quantity of pure benzpyrene. (Author abstract)

37461 **APTIC NO. 60228**

Tsuji, Yoshito

AIR POLLUTION AND HUMAN HEALTH. *(Taiki osen to kenko). Text in Japanese. Fukushima Igaku Zasshi (Fukushima Med. J.), 22(5-6):159- 160, Dec. 1973. (Presented at the Fukushima Medical Association, Annual Meeting, 94th, Nov. 11, 1973.)*

Influences of air pollution on the human body generally appear as epidemiological increases of non-specific disturbances of pulmonary functions resulting from interactions between the pollutant, the environment, and the host. Initial effects are eye and respiratory system irritations, followed by increases in airway resistance and mucus secretion, and they end in acute and chronic diseases such as bronchitis and emphysema. Air pollution increases discomfort experienced in chronic diseases. The known effects of specific pollutants are described, with special attention given to suspended dusts and fluorine compounds.

37462 **APTIC NO. 60191**

Udai, G., M. Oka, S. Yamaoka, M. Fukuda, and T. Kanasaki

STUDIES ON EFFECTS OF URBAN POLLUTED AIR ON EXPERIMENTAL ANIMALS. PART IV, A PATHOHISTOLOGICAL STUDY ON EXPOSED ANIMALS. *(Toshi osen taiki ni yoru dobutsu bakuro jikken -dai 4 po- byori soshikigakuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):425, Oct. 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Three groups of 4-week old rats were exposed to air heavily polluted by traffic, air from an area with moderate traffic, and clean room atmosphere for 100 days and their major organs were histologically examined. Animals exposed to the heaviest traffic pollution showed dust deposition on bronchial and tracheal mucosa cells, lymph in submucosal tissues, increased mucosal secretion of the bronchial epithelium, and dust in the alveoli and lymphatic system. The same symptoms appeared in the animals raised in the less polluted atmosphere, but greatly reduced in severity. Animals exposed to the clean room atmosphere showed no dust deposition and only minute changes in the bronchioles. No pathological changes were noted in the brain, liver, or kidneys of the three groups. In the animals bred in the traffic polluted area, dust deposition and bronchitis were the major health effects.

37463 **APTIC NO. 59786**

Vigliani, Enrico

MEDICAL ASPECTS OF AIR POLLUTANTS. *(Gli aspetti medici degli inquinamenti atmosferici). Text in Italian. Lo Smog (Italy), 1973:7-16, 1973.*

Medical aspects of air pollutants, such as sulfur dioxide, dust, lead, oxidants, and 3,4-benzopyrene are reviewed, and pollutant concentration measurement carried out in Milan are described. The smoke, dust and SO2 concentrations measured in Milan were highest during the winter period, which is due to the influence of domestic heating. The dust concentrations measured during winter and summer averaged 0.5 and 0.15 mg/cu m, respectively. In streets with high traffic density, carbon monoxide concentrations of 20-100 ppm were measured. Dust samples from these streets contained 2.4 to 7.4 micrograms of lead per cu m of air. Systemic poisoning, irritation of the bronchial mucosa and of the eyes, and lung cancer may be due to different air pollutants. Systemic poisoning is caused mainly by CO and lead emitted by gasoline engine-powered vehicles, while sulfur dioxide, and especially sulfuric acid, formed from SO2, and oxidants, such as nitrous gases, peroxides, free radicals, aldehydes, as well as oxidized and polymerized hydrocarbons, are powerful irritants of the respiratory mucosa and of the eyes. Certain combustion products, such as 3,4-benzo(a)pyrene, 1,2-benzoperylene, chrysene, 1,2-benzopyrene and pyrene are carcinogenic. Tumors are caused by small doses of carcinogenic agents during long exposure, or by a very small dose of carcinogens which produce tomoral latency by cell modifications. Increases in the occurrence of lung cancer in highly industrialized North Italy have been observed during the last few years.

37464 **APTIC NO. 59395**

Voisin, C. and V. Macquet

ACUTE RESPIRATORY CONDITIONS AND AIR POLLUTION. *(Affections respiratoires aigues et pollution atmospherique). Text in French. Rev. Prat., 23(5):343-351, Jan. 1973.*

Mortality and morbidity rates due to acute respiratory conditions appear to correlate with sudden increases of atmospheric pollution, especially among children and subjects suffering from chronic respiratory failure. Animal experiments have confirmed the noxious effect of such pollutants as sulfur dioxide, nitrogen dioxide, and ozone which act in different ways either by triggering a bronchiospastic reaction or by depressing the natural resistance of the respiratory system against infection. Additional research is required to elucidate those pollutants which are the most dangerous and to establish preventative measures.

37465 **APTIC NO. 60190**

Watanabe, H., O. Fukase, K. Isomura, and Y. Makihata

EFFECTS OF OZONE ON REDUCING SUBSTANCES IN LIVING BODY. *(Ozon no seitai nai kangen busshitsu ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):426, Oct. 1973. (Presented* *at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

In order to study the effects of ozone on the redox metabolic system, mice were exposed to ozone and the behavior of glutathione and vitamin C was examined. Two series of exposures were done, the first consisting of single exposures to ozone at levels of 0.6, 1.2, 2.0, 4.0, and 8.2 ppm for 4 hr, and the second of repeated exposures at levels of 0.0, 0.2, 0.5, and 1.0 ppm, 4 hr a day for 30 days. The brains, lungs, and livers of the mice were examined. Single exposures to ozone caused a decrease in lung vitamin C at 4 ppm and 8 ppm caused death. Glutathione did not decrease as much, and GSH showed a transient decrease at levels above 2 ppm in the liver. In the repeated exposures, vitamin C and GSH in the lung increased as the concentration of ozone was higher and the exposure was longer. No changes in the brain were noted.

37466 **APTIC NO. 59229**

Waters, Michael D., Donald E. Gardner, and David L. Coffin

VANADIUM: CYTOTOXIC EFFECTS ON RABBIT ALVEOLAR MACROPHAGES IN VITRO. *Preprint, Society of Toxicology, 31p., 1973. 58 refs. (Presented at the Society of Toxicology, Annual Meeting, 12th, New York, March 18-22, 1973.)*

The cytotoxic effect of vanadium was investigated on rabbit alveolar macrophages (AMs) in in vitro studies. The Ams obtained by lung lavage were exposed to particulate forms of vanadium pentoxide, vanadium trioxide, or vanadium dioxide over a concentration range of 0.1 to 100 micrograms V/ml (ppm V) of culture medium. Cell viability after a 20 hr exposure was reduced by 50% at these concentrations: 13 micrograms/ml V2O5, 21 micrograms/ml V2O3, and 33 micrograms/ml VO2. The toxicity was directed related to solubility in the order V2O5 greater than V2O3 greater than VO2. When V2O5 was dissolved in media prior to exposure of cells, only about 9 micrograms V/ml was required to reduce viability by 50% in 20 hr. Total cell numbers decreased 70% in 20 hr in dissolved V2O5 at 10 micrograms V/ml, compared to control cultures. Exposure of cells or cell free sonicates to levels of dissolved V2O5 as high as 50 micrograms V/ml produced only small changes in the specific activities of lysozyme or beta-glucuronidase. Acid phosphatase in the cell free system was 70% inhibited by dissolved V2O5 at 1 microgram V/ml. (Author abstract modified)

37467 **APTIC NO. 59542**

Waters, Michael D., Donald E. Gardner, and David L. Coffin

METAL TOXICITY FOR RABBIT ALVEOLAR MACROPHAGES IN VITRO. I. EFFECTS OF CELL VIABILITY, CELL NUMBERS AND A LYSOSOMAL HYDROLASE. *Preprint, Society of Toxicology, Richmond, Va., 24p., 1973. 25 refs. (Presented at the Society of Toxicology, Annual Meeting, 12th, New York, March 18-22, 1973.)*

A model system in vitro was employed to assess the relative cytotoxic properties of soluble salts of metals that occur as environmental contaminants. Rabbit alveolar macrophages obtained by lung lavage were exposed in tissue culture for 20 hr to chlorides of cadmium, nickel, manganese, and chromium and to ammonium vanadate. Cell viability was decreased by 50% at concentrations of 0.1-0.2 mM of Cd and V and 4-5mM of Ni, Mn and Cr. The specific activity of acid phosphatase, a lysosomal indicator enzyme, was also decreased at comparable concentrations. All metals except Cd produced significant decreases in numbers of cells at concentrations that affected cell viability. Comparison of the relative cytotoxicity of the various metals was made by expressing the number of viable cells remaining after 20 hr as a percent of the total number of cells in control cultures at 20 hr. Cadmium and V appeared 37-62 times more toxic for alveolar macrophages than did Ni, Mn, or Cr. (Author abstract modified)

37468 **APTIC NO. 59730**

Weir, F. W. and T. H. Rockwell

AN INVESTIGATION OF THE EFFECTS OF CARBON MONOXIDE ON HUMANS IN THE DRIVING TASK. FINAL REPORT. *Ohio State Univ. Research Foundation, Columbus, Ohio, Preventive Medicine Group and Systems Research Group, Coordinating Research Council, Inc., Environmental Protection Agency Contract 68-02-0329, CRC-ARRAC Proj. CAPM-9-69, RF Proj. 3141, 3332, Rept. EPA-650/1-73-003, 182p., Jan. 1973. 70 refs.*

Findings of a 2-year investigation of the effects of carboxyhemoglobin (expressed as percen of hemoglobin combined with carbon monoxide) on human performance, particularly in relation to the task of driving an automobile are presented. Major objectives were: the development of methods for rapid and accurate laboratory and field measurement of carboxyhemoglobin in man; the determination of the effects of up to 20% COHb on physiological performance, complex psychophysiological and psychomoter skills, and driving skills and judgment on the highway; and the determination of the predictability of decrement in driving skills based upon laboratory skills testing. The testing employed 40 subjects on the highway with a battery of real driving situations and/or laboratory tasks related to driving skills. The results generally suggested consistent patterns of performance changes with increased COHb levels, and differences observed with 20% COHb levels were directionally preserved with lower (7 and 14% COHb) levels but with smaller magnitude differences. Strong correlations between performance on simple laboratory tasks and COHb levels were not observed. Driving performance was categorized into three levels: visual (perception and information acquisition), control (psychomotor), and dynamic response (time delayed vehicle response). The largest magnitude effects with increased COHb levels occurred at the early stages of information processing; visual and psychomotor control measures were generally the first measures to be affected. (Author summary modified)

37469 **APTIC NO. 60161**

Yoshida, Katsumi

A RESPONSE TO THE QUESTIONS OF PROFESSOR KYOICHI TATEDA. *(Tateda Kyoichi-shi ni kotaeru). Text in Japanese. Shoni Hoken Kenkyu (J. Child Health), 32(2):90-92, 1973. 10 refs.*

Responses are made to the questions raised to the first article by this writer proposing measures for the protection of schoolchildren in a polluted area from the further victimization. The promotion of disease control and the protection of children s health are natural responsibilities of those who are engaged in the health care and have nothing to do with excusing the responsibility of those emitting air pollutants, and the writer has no intention of ignoring the social responsibilities of those parties. The fact that most children who do not need special care are forced to lead an inhibited life and as treated together with the sick children is depriving them of normal physical activities and causing more damage. Most of the chronically asthmatic children in Yokkaichi are recovered by the time they are graduated to high schools, and the recovery rate is almost the same as that of the control area schools. This only testifies to the need for special care for the children of lower school ages. The excessive and unnecessary use of asthmatic drugs is a serious problem in Japan and should be strongly controlled.

1972

37470 **APTIC NO. 59237**

Antweiler, H.

COERGISM - TOXICOLOGIC ASPECTS OF THE EVALUATION AND STUDY OF THE BIOLOGIC ACTIVITY OF AIR POLLUTANTS. *(Kombinationswirkung*

- Toxikologische Aspekte bei der Beurteilung und Erforschung der biologischen Wirksamkeit luftverunreinigender Stoffe). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 120-128. 25 refs.

Toxicologic and general biological studies and experiments on the mechanisms of the simultaneous or successive synergic and antagonistic action of air pollutants on the human and animal organism are reviewed. Coergic action interferences of various air pollutants manifest themselves mostly in changes in the intensity, rather than in the quality, of the action. Air pollutants acting upon the organism may partly or totally suppress the action of another air pollutant, or the actions of two or more pollutants may add up, and certain pollutants may even potentiate the effect of others. Physical and chemical processes, such as adsorption of gaseous or liquid pollutants on solid ones, may lead to inactivation or potentiation of the toxic effect. The resorption of nitrogen dioxide is reduced by edema developed in the alveolar walls due to previous inhalation of this gas. The elimination of quartz dust from the lung may be retarded by sulfur dioxide, carbon monoxide, and NO2. Increased resistence to benzo(a)pyrene with the presence of quartz in the lung and after ozone inhalation was observed. Active interferences may be due also to changes in enzymatic activities brought about by other pollutants. Benzo(a)pyrene, methyl cholanthrene, and other aromatic hydrocarbons induce enzymes that accelerate their metabolism in the organism. The competition of different air pollutants for the same receptor in the organism may result in activation or potentiation. Both synergistic and antagonistic effects may result from physiological coergism, i.e., the interaction of pollutants due to their reactions with different receptors.

37471 **APTIC NO. 59233**

Baumann, H. and W. Weller

DISTRIBUTION OF QUARTZ IN THE ORGANISM. *(Verteilung von Quartz im Organismus). Text in German. Inst. Natl. Rech. Chim. Appl., Dixieme Colloq. Atmos. Polluees, Proc., Paris, France, 1972, 10p. (May 3-5.)*

The distribution of different types of quartz was studied in rats that were injected with 50 mg of quartz in 1 ml isotonic saline solution. Up to two thirds of the quartz injected was detected, of which about 50% was found free in the abdominal cavity. While the omentum contained no quartz at all in a few cases, it contained 10-25% of the total quartz injected. The amount of quartz found in the lung and kidney was negligible, and the liver contained by 30 times less quartz than the omentum did. The spleen contained relatively a large quantity of quartz. The distribution in the regions and organs in the abdominal cavity was found to be independent of the type of the quartz dust injected, and it remained unchanged for several weeks. However, the retention, storage, and transport of quartz in the spleen and in the lymph nodes was found to be essentially determined by the properties of the quartz. A very high rate of retention, storage and transport to the lymph nodes of quartz dust with pure surfaces by the spleen was determined. The same type fo quartz with a three molecule surface layer of adsorbed silicic acid was retained to a lesser degree by the spleen, but this lymphotropic property was less pronounced for larger particles. The strongly lymphotropic quartz with clean surface had less damaging effect on the organs than the less lymphotropic, non-cytotoxic, silicic acid-covered quartz.

37472 **APTIC NO. 59550**

Beck, E. G. and N. Manojlovic

ATMOSPHERIC DUST AND ITS COMPONENTS. *(Atmosphaerischer Staub und seine Komponenten). Text in German. In: Medizinisches Institute fuer Lufthygiene und Silikoseforschung, Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, June 1972, p. 28-32. 16 refs.*

Studies on the composition and the effects on the human and animal organisms of atmospheric dust are reviewed. Atmospheric dust is composed mainly of fine particulate matter, soot, and also of water-soluble sulfate ions, water-soluble nitrate ions, trace elements, such as lead, iron, manganese, nickel, chromium, and cadmium, as well as organic substances such as benzo(a)pyrene, The yearly average dust concentration in the atmosphere is in the order of magnitude of 100 micrograms/cu m. Dust, like any air pollutant, may increase the susceptibility of the organism to infections and diseases, as it was proved on mice with Salmonella typhi murim following exposure to lead. Fine dust components are believed to contribute to such phenomena as premature aging, alternation of the male-female ratio, and to the increased incidence of leukemia and cancer. Inhibition of the breakdown of benzo(a)pyrene in the organism by fine dust and lead was observed. Potentiation of the effect s of carbon monoxide and fine dust in the organism, and of fine dust extract and leukemia viruses was evidenced.

37473 **APTIC NO. 59248**

Brockhaus, A.

PARTICULATE AIR POLLUTANTS. *(Partikelfoermige Luftverunreinigungen). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 27-34, 1972. 7 refs.*

Studies on the deposition, transport, and elimination of inhaled dust are reviewed. Nearly quantitative deposition of dust particles with aerodynamic diamaters over 7 micron in the nasopharyngeal cavity was determined. The separation in the tracheobronchial zone is negligible with well below 10% for all diameters. The alveolar deposition has its maximum for a particle diameter of about 2 micron, and its minimum at 0.5 micron. Rapid increase in the rate of alveolar retention with decreasing particle diameter below 0.5 micron was observed. Respirable dust particles may contain small amounts of toxic gases adsorbed on their surface so that the toxic gases are accumulated in rather high concentrations on the contact site in the respiratory tract. Following deposition along the respiratory tract, the dust particles may be subject to mechanical transfer or dissolution. Inhaled dust can be transferred from the upper and lower sections of the respiratory tract into the gastronintestinal tract, and, into the blood or the lymph system.

37474 **APTIC NO. 59246**

Bruch, J.

ASBESTOS. *(Asbest). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 101-105, 1972. 24 refs.*

Studies and experiments on the carcinogenic and fibrogenic effects of asbestos dust are reviewed. Clinical-epidemiological studies revealed significant increases in the frequency of pulmonary tumors and mesotheliomas in cities with asbestos mines and asbestos processing industries, even in the part of the population that was not occupationally exposed to asbestos. Ferruginous bodies were found in the lungs of test animals following intratracheal injection of aluminum silicate needles and of glass fiber. Rats and hamsters, having inhaled glass fiber dust (needle-shaped particles) for 2 yr, developed foci of septal fibrosis and collagen fibers in the lymph nodes. The carcinogeneicity of asbestos dust is generally believed to be due to the inherent needle shape of the particles. Adenomatous growth of alveolar epithelium cells in pleural plaques after intrapleural injection of chrysotile was observed. Such stimulation of the alveolar epithelium is asbestos-specific since no such changes due to silicogenic quartz and inert dusts were observed.

37475 **APTIC NO. 59236**

Dolgner, R., K.-H. Friedrichs, and H. Steiger

COERGISM - METROLOGIC AND EPIDEMIOLOGIC PROBLEMS. (Kombinationswirkung - Messtechnische und epidemiologische Probleme). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 90-95.

General epidemiological and metrological problems of coergic air pollutants are discussed. Studies of the long-term effects of simultaneously acting air pollutants require knowledge of the long-term effects of the individual components, which can be obtained by animal tests and by epidemiological surveys. The methods of occupational hygiene can not be applied to the study of the coergism of air pollutants in the free atmosphere since the latter is characterized by the presence of a multitude of air pollutants of varying concentrations in time and space, pollutants that may enter a great variety of reactions before, during or after exerting their effect on the organism. Mortality studies are unsuitable for the study of coergic air pollutants, while comparative observations of the morbidity, as well as the reaction and developmental status of populations constitute a valuable tool in such epidemiological research. The selection of special populations, e.g., children, aged, and sick, is also useful. Moreover, populations that are exposed to identical air pollutants with only one missing in one population should be selected.

37476 **APTIC NO. 59489**

Fodor, G. G. and G. Winneke

CARBON MONOXIDE: ITS EFFECTS ON THE CENTRAL NERVOUS AND THE CARDIOVASCULAR SYSTEMS. *(Kohlenmonoxid: Zentralnervoese und kardiovaskulaere Wirkungen). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforschung, Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 96-103. 28 refs.*

Studies and experiments concerning the effects of carbon monoxide on the central nervous system and on the cardiovascular system are reviewed. Intensified arteriosclerotic changes of the aorta walls in cholesterin-fed rabbits inhaling 180 ppm CO for 10 weeks were observed. Pathologic changes of the aorta walls were also observed in animals with carboxyhemoglobin levels around 9% that were fed no cholesterin. Changes in the alveolocapillary gas exchange, in blood circulation, and in the myocardial metabolism due to COHb levels of 5-10% were found. Chronic exposure to low CO concentrations accelerates and aggravates the development of arteriosclerotic heart diseases. Subtoxic CO concentrations reduce the oxygen partial pressure in the cerebral tissue from about 8 torr to below 1 torr at COHb levels of about 2.5% and upwards. A tendency for increased deep sleep during the initial period of the exposure to CO was noted. Impairment of mental, sensory, and psychomotor functions under the influence of CO was evidenced. The maximum allowable CO concentration in the air should be set at 9 ppm, and the COHb value should be limited to about 2% on the basis of effects on the central nervous system.

37477 **APTIC NO. 59563**

Fodor, G. G. and M. Meyer-Hammer

ORGANIC VAPORS. HAZARDS OF XYLENE VAPORS. *(Organische Daempfe. Gefaehrdung durch Xyloldaempfe). Text in German. In: Medizinisches Institut fuer Lufthygiene und Silikoseforscnung Jahresbericht 1971. Duesseldorf, Michael Triltsch Verlag, 1972, p. 89-96. 39 refs.*

Studies and experiments on the toxic effects, resorption, elimination, and metabolism of xylene in the human and animal organisms are reviewed. The rate of pulmonary retention of xylene vapors by the human organism was found to be 60%. While xylene is easily resorbed through intact skin, poisonings due to percutaneous uptake is unlikely. Quantitative resorption of xylene from the gastrointestinal tract was observed. Xylene resorbed in the organism is stored mainly in lipid-containing organs, such as the adrenal gland, bone marrow, spleen, brain, kidney, and the liver. Orally-administered xylene isomers were found to be converted to corresponding toluic acids which are then converted into water-soluble substances in the liver, and finally excreted in the urine in the form of conjugates of glucoronic acid, glycerine, and sulfuric acid. The oxidation of the benzene ring leads to the formation of xylenols. Also partial hydroxylation of all three isomers was observed. The metabolites of xylene are non-toxic, and xylene is less toxic than either benzene or toluene. Only negligible quantities of toluic acid were detected in human urine samples. Narcotic effect of high xylene concentrations, and paresthesia, equilibrium troubles, nausea, vertigo, psychic troubles, anorexia, irritability, and reduced tolerance for alcohol due to chronic exposure to xylene were observed. Hypoplasia of the bone marrow due to chronic exposure was also observed. Dilatation of the aorta and hypertension in xylene-exposed printers were diagnosed.

37478 **APTIC NO. 59247**

Hilscher, W., J. Bruch, and G. Gauss

QUARTZ AND QUARTZ-CONTAINING MIXED DUSTS. *(Quartz und quartzhaltige Mischstaeube). Text in German. Medizinisches Inst. fuer Lufthygiene und Silikoseforschung, p. 137-145, 1972. 33 refs.*

Studies on the mechanism of the action of quartz and quartz-containing mixed dusts on organisms are reviewed. Functional irritation of the lymphocytes in silicosis and silicotuberculosis, manifesting itself in increased activity of oxidizing cell eyzmes, and in reduction of the activity of the glycolytic enzymes, was observed. Increases in the total lipid and phospholipid levels in the lung following intratracheal injection of quartz dust were evidenced. Following intratracheal injection and inhalation of quartz dust, proliferation of both alveolar macrophages and type II pneumocytes were observed. The lymph node test is rated as the most sensitive of all in vivo tests in the determination of the aggressivity of dusts and of therapeutic results. Subacute effect of mine dust on the cells and retarded toxic effect were observed. Serum and lung fluid partly or totally suppressed the toxicity of the dust temporarily. Animal tests indicate the absence of linear correlation between toxicity and quartz content, and between toxicity and fibrogeneicity.

37479 **APTIC NO. 59568**

Ho, W., M. Benton, and A. Furst

THE CLEARANCE OF BENZO(A)PYRENE AND FERRIC OXIDE FROM MOUSE LUNGS. *Proc. West. Pharmacol. Soc., vol. 15:58-60, 1972. 8 refs.*

Benzo(a)pyrene (BP) induces tumors in the hamster lungs. How different species eliminate a substance from the lungs may have an important bearing on its ability to induce tumors. To study this, an 0.02 ml suspension of BP absorbed to ferric oxide was introduced intratracheally into the lungs of NIH-Swiss mice. At daily intervals, three mice were killed and their lungs excised. In addition, a representative number of lungs was processed for histopathological analyses. The histological sections of mouse lungs immediately after the intratracheal introduction revealed extensive penetration of the dust suspension into the alveoli. Two to three months after treatment most of the Fe_2O_3 was observed in the macrophages. The greatest concentration of engorged macrophages occurred around the peribronchiole regions. Some of these cells were also detected in the lumens of alveoli and peribronchiole and perivascular lymphoid tissues. Of the estimated 0.3 mg each of BP and Fe_2O_3 instilled into the lungs of each mouse, approximately 30% to 40% was assayed the first hr after treatment. Although the quantitations of both chemicals were not precise, there were two distinct clearance rates. The PB was almost completely eliminated from the mouse lungs by the 4th day; Fe2O3 was reduced by only 30% at the 7th day. The clearance rate of a second BP instillation was accelerated, while the Fe2O3 content remained stable.

37480 **APTIC NO. 59956**

Kurokawa, K.

SEVERAL PROBLEMS CONCERNING AIR POLLUTION AND DISTURBANCE OF HEALTH. *(Taiki osen to kenko shogai ni kansuru sho mondai). Text in Japanese. Akita ken Ishikai Zasshi (Akita Med. J.), 25(2):84- 90, 1972. 31 refs.*

World Health Organization regulations concerning sulfur dioxide, particulates, nitrogen dioxide, oxidants, carbon monoxide, and smoke are mentioned. Effects of pollutants on human health are dependent upon direct influences, synergism, bioclimatology, and toxic tolerances. Certain respiratory diseases such as chronic bronchitis and bronchial asthma are used as indices of the chronic effects of localized pollution. Problems of carcinogenic hydrocarbons in urban smoke, eye irritation, respiratory diseases, heavy metal poisoning, and symptoms caused by photochemical smog are discussed.

37481 **APTIC NO. 59959**

Nishimaki, Yoshimichi

A REPORT FROM CHIBA CITY ON THE AIR POLLUTION OF THE CITY EXCEEDING THAT OF KAWASAKI, FUJI AND YOKOHAMA. *(Chiba-shi karano hokoku; Kawasaki, Fuji, Yokohama o shinogu taiki osen). Text in Japanese. Kankyo Hakai (Environ. Destr.), 3(5):61-71, 1972.*

Results of questionnaires surveying morbidity of subjective respiratory symptoms show Chiba city to be higher in incidence of air pollution-related diseases than Kawasaki, Fuji, or Yokohama. Chiba city contains about 40,000 inhabitants and is polluted by steel factories, iron works, and electric power plants. Morbidity of cough, sputum, bronchitis, asthma, and rhinitis was higher in Chiba than any of the other cities surveyed.

37482 **APTIC NO. 59763**

Pietsch, Richard L.

VALIDATION OF HUMAN IRRITATION BY TEAR LYSOZYME LEVELS. (FINAL REPORT). *Durham, N. C., Environmental Protection Agency Contract 68-02-0096, APTD-1362, 18p., Aug. 1972. 13 refs.*

NTIS: PB 224537/AS

Tear samples were collected from 358 volunteers in Southern Calif. in smog polluted areas to determine the feasibility of using tear lysozyme levels as an objective indicator of eye irritation. No consistent variation of lysozyme concentration with oxidant concentration was demonstrated. Subjects exposed to .19 ppm of oxidant in the open air did show decreased lysis. A threshold effect is possible. No correlation was established between lysis and mild subjective complaints of irritation. Objective indications of eye irritation showed a mild decrease inllysis levels. (Author summary modified)

37483 **APTIC NO. 59263**

Zarkower, A. and W. Morges

ALTERATION IN ANTIBODY RESPONSE INDUCED BY CARBON INHALATION: A MODEL SYSTEM. *Infec. Immunity, 5(6):915-920, June 1972. 19 refs.*

The immune response in mice to antigens given by intraperitoneal, intravenous, and inhalation routes was compared in control and carbon dust-exposed mice. The most pronounced effect, a decrease in antibody-forming cells and serum agglutinin titers, was observed when the carbon-treated animals were immunized with antigens in aerosol form. Similar results were obtained when the antigens were administered by intravenous or intraperitoneal routes. In contrast, 4 days of preexposure to carbon dust increased the number of antibody-forming cells in the mediastinal lymph nodes. However, this effect was transient and was not significant when the carbon preexposure was continued for 15 days. (Author abstract)

1970

37484 **APTIC NO. 59475**

Devos, A.

AIR CONTAMINATION AND DISEASE PROBLEMS IN POULTRY. *Int. Vet. Stud. Assoc. Mag., 1970:14-15, 1970. 9 refs.*

A constant air volume was collected in poultry houses with a Casella bacteria sampler prior to and during the arrival of birds in an effort to investigate the connection between diseases of the digestive and respiratory tract, paralysis, and tumors and air contamination. A serious disease of air contamination in terms of total aerobe flora and enterobacteriaceae was observed. Various disinfection methods were then employed to eliminate the contamination. Further investigations appear necessary to arrive at a conclusion concerning the transmission of the diseases and the effectiveness of disinfection measures.

1968

37485 **APTIC NO. 59466**

Hecko, I., J. Grunt, and J. Ambrus

THE PRINCIPLE OF HOMEOSTASIS AND THE CHANGES IN THE BLOOD PICTURE OF CHILDREN DUE TO CHANGING CONDITIONS IN THE ENVIRONMENT. *J. Hyg. Epidemiol., Microbiol., Immunol. (Prague), no. 12:488-497, 1968. 16 refs.*

Repeated hematological examinations were performed on 60 children (average age of 7 years) selected in equal numbers from town and country areas in an effort to examine the effects of changing environmental conditions on blood picture. The town children were from Bratislava and lived in the vicinity of a chemical plant; the area had high concentrations of dust, hydrogen sulfide, and sulfur dioxide. The hematological results showed no statistically significant differences between the two groups despite clearly different environmental and hygienic conditions of life in the town and country. Significant statistical differences for both groups, however, were found between some hematological values obtained after the beginning of the school and values determined before the end of the same school year. (Author summary modified)

37486 **APTIC NO. 59548**

World Health Organization, Geneva (Switzerland)

RESEARCH INTO ENVIRONMENTAL POLLUTION. REPORT OF FIVE WHO SCIENTIFIC GROUPS. (FINAL REPORT). *World Health Organ. Tech. Rept. Ser., no. 406: 1-83, 1968.*

Collective views of international groups of experts on environmental pollution are reported by five World Health Organization groups. Topics covered under the subject of air pollution include: purposes of air pollution investigations, sampling principles and procedures, measurement of air pollution, analytical methods, biological effects as indicators of pollution, choice of devices and instruments, air pollutants dangerous to man, evidence of respiratory and other effects from laboratory studies, and control and prevention of air pollution.

EFFECTS-PLANTS AND LIVESTOCK

1974

37487 **APTIC NO. 59355**

Beamish, Richard J.

GROWTH AND SURVIVAL OF WHITE SUCKERS (CATOSTOMUS COMMERSONI) IN AN ACIDIFIED LAKE. *J. Fish. Res. Bd. Can., 31(1)49-54, 1974. 17 refs.*

White suckers (Catostomus commersoni) in the acidic Lumsden Lake in 1967 and 1968 exhibited reduced annual growth followed by death. The reduced growth and death appeared directly related to the low pH and not to a shortage of food caused by the decreasing pH. Examination of heavy metals, in the lake from precipitation fallout showed that only zinc levels (24-33 micrograms/l) were sufficiently high to be potentially hazardous to fish. The heavy metal, although not of sufficient magnitude to be considered the principle stressing agent, may have acted synergistically with the acid, influencing its concentration. (Author abstract modified)

37488 **APTIC NO. 59855**

Burschel, Peter

FORESTRY BETWEEN ECOLOGY AND ECONOMY. *(Waldbau zwischen Oekologie und Oekonomie). Text in German. Allg. Forstz., 29(8):153-158, Feb. 23, 1974. 37 refs.*

Ecological and economical problems of forestry are discussed. For the oxygen household of the atmosphere, forests have no importance. However, the roughness of forest surfaces influence the flow of air. Forests cause turbulence at the boundary between the forest and free atmosphere which improves the dispersion of pollutants. Not enough details are known yet about turbulence to permit any conclusions concerning measures taken by forest engineers. For avoidance of damage caused by air pollutants such as sulfur dioxide, fluorine, and chlorine, smoke resistant trees can be planted or deciduous trees instead of the more sensitive coniferous trees. The acidification of forest soil through SO2 can be combated by application of lime.

37489 **APTIC NO. 60117**

Horak, O. and I. Huber

PLANT AND SOIL POLLUTION BY LEAD RESIDUES OF PETROL ENGINES. *(Verunreinigung von Pflanzen und Boeden durch Bleirueckstaende aus Benzinmotoren). Text in German. Bodenkultur, 25(1):34-47, Feb. 1974. 26 refs.*

Lead residues in aerial plant material samples and in soil samples taken at distances of up to 70 m from roads, highways, and airport runways in Austria were determined by atomic absorption spectrometry. The aerial parts of plants contained 3 to 220 ppm lead in the dry matter, depending on the distance from the road. Remnants of dried plants in early spring contained up to 539 ppm lead. The lead content in the plants decreased with the distance from the road first rapidly, then slowly. Up to 54% of the lead could be removed from the plants by washing them with water. Lead emitted by sport planes was detected in some plants close by or on the runways. In soil samples taken near highways and far off the roads, lead concentrations of 27-290 ppm and 12-30 ppm, respectively, were determined.

37490 **APTIC NO. 59892**

Scholl, Gerhard

DETERMINATION OF THE POLLUTION OF THE VEGETATION BY HEAVY METALS IN VARIOUS EMISSION AREAS. *(Ermittlung ueber die Belastung der Vegetation durch Schwemetalle in verschiedenen Immissionsgebieten). Text in German. Staub, Reinhaltung Luft, 34(3):89-92, March 1974. 14 refs.*

The intake of zinc, lead, and cadmium by grass cultures in air polluted areas grown under standard conditions was studied. In an area of about 1000 sq km in the Western Ruhr Area, 42 measuring points were erected spaced 4.95 km apart. In addition, plant samples were taken in a 10 sq km area in the vicinity of a zinc plant. Along the Autobahn, measurements of the zinc, lead, and cadmium concentration in the vegetation were taken in distances of 1, 15, 25, 50 and 100 m. The results revealed that in the three emission areas, the heavy metal pollution of the vegetation varied greatly and in part reached exceptionally high values. The intake rates from emissions alone, as well as from combined intake composed of heavy metals in the air and in the soil are listed in tables. Total intake rates between 66.2 and 147.1 ppm zinc, 8.3 and 35.5 ppm lead, and 0.41 and 1.15 ppm cadmium were measured in the Western Ruhr. The highest concentrations were found in the urban and industrial areas of the South between Rheinberg and Bochum. In the central and Northern Ruhr section with primarily a rural character, the total intake was hardly higher than that of the controls from nonpolluted areas. In the vicinity of the zinc plant, significantly higher heavy metal concentrations were also measured. The zinc concentrations were 181 to 1017 ppm, the lead concentrations were 12-41 ppm, and the cadmium concentrations were 0.1 to 10.4 ppm. The zinc and cadmium enrichment in the vegetation was highest close to the emission source and dropped with increasing distance at first rapidly then more slowly. In vegetation samples taken near the highway, a high enrichment of lead, and to a lesser extent of zinc and cadmium, was found at the edge of the highway. Here 74.4 ppm lead, 107.7 ppm Zn, and 0.5 ppm Cd were measured in the dry mass. With increasing distance from the highway the lead concentration dropped, at first steeply then slowly, and was down to 15 ppm in a distance of 100 m. The Cd intake was already markedly lower at 15 m, the Zn intake at 25 m.

37491 **APTIC NO. 60229**

Seki, T., Y. Inoue, S. Abe, H. Hoshikawa, N. Mawariya, and S. Kondo

EFFECTS OF AIR POLLUTION ON PLANTS, PART 2. ON THE SULFUR CONTENT OF LEAVES OF ROADSIDE TREES IN SENDAI CITY. *(Taiki osen no shokubutsu ni taisuru eikyo (dai 2 ho) Sendai shinai ni okeru gairoju-yo no io ganryoni tsuite). Text in Japanese. Koshu Eisei (Public Health), 38(1):50-52, Jan. 1974. 7 refs.*

The sulfur content of different species of roadside tree leaves were determined at 30 points on main roads in urban and suburban Sendai city. Air quality measurements with an automatic sulfur oxides recorder were used to show the variable toxic tolerances and rates of retention of sulfur for different leaves.

1973

37492 **APTIC NO. 59298**

Crudgington, D. R., J. Markland, and J. Vallance

THE UPTAKE OF LEAD BY VEGETABLES FROM SOIL. *J. Ass. Pub. Anal., vol. 11:120-126, Dec. 1973. 2 refs.*

Determinations were made for the lead content of vegetables and soil in the Matlock area of Derbyshire in an effort to assess the extent of Pb uptake from the soil; soil concentrations of zinc and cadmium were also investigated. Although there was evidence of Pb in whole samples of root vegetables (difficult to wash free of soil), the peeled roots contained very little metal, and the results afforded no evidence of Pb uptake from the soil. The atmosphere was clearly a source of Pb as demonstrated by the tops of gooseberries and blackcurrants and their washings; tests on outer leaves of lettuce and brassicas also pointed to airborne Pb. A Pb-processing works was located near the test area. The Pb, Zn, and Cd concentrations for a variety of garden soils were also investigated and recorded.

37493 **APTIC NO. 59808**

Delzenne and van Haluwyn

CONTRIBUTION TO THE STUDY OF THE DISTRIBUTION OF EPIPHYTIC LICHENS IN NORTHERN FRANCE. APPLICATION TO THE PROBLEM OF AIR POLLUTION. *(Contribution a l etude de la distribution des lichens epiphytes dans le nord de la France. Application au probleme de la pollution atmospherique). Text in French. Pollut. Atmos. (Paris), 15(60):415-420, Oct.-Dec. 1973.*

The distribution of such epiphytic lichen species as Lecanora conizaeoides, Parmelia acetabulum, and Lobaria pulmonaria, as well as sulfur dioxide and soot concentration measurements, performed during January, February, and March, 1973, in the North Department and in the Lille industrial agglomeration are described. While L. conizaeoides and P. acetabulum, species resistant to air pollution, were widely spread in most of the area studied, l. pulmonaria, being highly susceptible to air pollution, was found only in three sites in the area where air pollution was lowest. Lichenological studies and actual SO2 and soot concentration measurements permitted distinction between nine different zones of air pollution. The SO2 concentrations measured in the Lille industrial agglomeration ranged from 96 to 206 micrograms/cu m in January, from 116 to 207 micrograms/cu m in February, and from 70-110 micrograms/cu m in March, while the soot concentrations were in the respective ranges of 71-124 micrograms/cu m, 71-103 micrograms/cu m, and 62-97 micrograms/cu m.

37494 **APTIC NO. 60141**

Iwanami, M., H. Negishi, and M. Hikima

INVESTIGATION AND STUDIES ON PLANT DAMAGE DUE TO TOKYO PHOTOCHEMICAL SMOG. PART V: EXPERIMENTS CONCERNING THE EFFECTS OF OZONE POLLUTION ON THE GROWTH OF TREES. *(Tokyo kokagaku sumoggu no shokubutsu higai ni kansuru chosa kenkyu; 5. ozon osen ni yoru jumoku no seiiku jokyo ni kansuru shiken). Text in Japanese. Tokyo-to Nogyo Shikenjo Kenkyu Nenpo (Annu. Rep. Tokyo Met. Agr. Exp. Sta.), 1972:5, Oct. 1973.*

Seven species of 2-year old seedlings (Zelkova, poplar, cherry platanus, Hymalayan cedar, ginkgo and Japanese red pine tree), were exposed two times (June and August) to aerial ozone at 0.2 ppm in an exposure room. The susceptibility to ozone was the highest in poplar, followed by cherry, then platanus, ginkgo, and Hymalayan cedar trees. Generally, the arboreal susceptibility to ozone was higher in June than in August.

37495 **APTIC NO. 59322**

Jensen, Keith F.

RESPONSE OF NINE FOREST TREE SPECIES TO CHRONIC OZONE FUMIGATION. *Plant Disease Reptr., 57(11):914-917, Nov. 1973. 7 refs.*

Yellow poplar, green ash, white ash, sycamore, red maple, silver maple, sugar maple, black walnut, and European black alder seedlings were fumigated with 30 pphm ozone for 5 mo. Significant reductions in growth of sycamore, sugar maple, and silver maple were found. The fumigated seedlings also tended to lose their leaves sooner than the unfumigated seedlings. The relationship between these findings and sensitivity classifications based on symptom development are discussed. (Author abstract)

37496 **APTIC NO. 59288**

Matsuoka, Yoshihiro, Tsuyoshi Takasaki, and Osamu Udagawa

THE RELATIONS BETWEEN ATMOSPHERIC SULFUR DIOXIDE AND ACCUMULATED SULFUR IN FOLIAGE. *(Shokubatsu yochu ni shuseki suru io seibun to taikichu no aryusan gasu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):538, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 264.)*

The cumulative effects of low concentrations of sulfur dioxide, which are often not visible in plants, were measured by sulfur accumulation measurements in leaves. Potted pear seedlings were exposed to a low concentration (0.15-1.20 ppm) of SO2 for 8 hr a day, up to 400 hrs. The results showed that the total S amount in leaves increased by exposure, but nonsoluble to S content in leaves did not show any difference from the control group; they were within the range of 61-29 mg/100 g. Sulfur absorbed in the form of SO2 gas was deposited in leaves in soluble form. When leaves are exposed to the same concentration of gases but for different lengths of time, the absorption rate decreased for each longer exposure time. When the total exposure concentration remained the same, the higher the concentration and the shorter the exposure time, the accumulation quantity was smaller. The lower the concentration, the greater the cumulative amount of S. The absorption speed is higher when concentration is higher.

37497 **APTIC NO. 59527**

Meyer, Milton William

ABSORPTION AND RELEASE OF AMMONIA FROM AND TO THE ATMOSPHERE BY PLANTS. *Maryland Univ., College Park, Dept. of Agriculture, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 73-28,881, 1973, 60p. 74 refs.*

Since the average ammonia concentration in the U. S. is 20 micrograms/cu m, and the industrial area of New Jersey averages 57 micrograms/cu m, foliar absorption of atmospheric NH3 was studied. Plants were grown in air containing 22, 110, and 320 micrograms of nitrogen(15) NH3/cu m. The aerial portions of corn, pigweeds, pind seedlings, and soybeans absorbed NH3 at a concentration of 22 micrograms/cu m. The absorption of NH3 was linear when the concentrations were 22, 110, and 320 microgram/cu m. Only 30% of the 15N-NH3 was retained by the plants, 10% was found in the exiting air, and 60% was unaccounted for. This suggests the possibility that the plant or the organisms associated with the aerial portions of the plant may have been instrumental in the loss. The plants were definitely an atmospheric sink for NH3 in normal air. It was possible, because of the design of the equipment, to fertilize the soil with 15N and to study the evolution of 15N-NH3 from the aerial portions of the pigweed and soybean plants contained in the plexiglas chamber. Ammonia was released from both plant species; however, only the pigweed released any appreciable quantities of 15N-NH3. (Author abstract modified)

37498 **APTIC NO. 59327**

Nakamura, Akira, Shinichi Chiyo, and Makoto Yao

ON SULFUR OXIDES AIR POLLUTION IN TOMAKOMAI, KOKKAIDO. *(Hokkaido Tomakomai chiku ni okeru io sankabutsu osen ni tsuite (daiippo)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):494, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 224.)*

The Tomakomai industrial site at present emits about 6600 N cu m/hr of sulfur oxides from its paper industries and thermal power plants. Further development of petroleum refining, petroleum chemical, and electric power plants in the eastern development site will increase the emissions. In order to control the further damages of valuable, rare plants in the eastern area, the sulfur content in plant leaves were measured. Samples of oak, Japanese oak, white birch, sage brush and some others were taken in July, August, and early September; they were washed, dried, and crushed, and the total sulfur and soluble sulfur in particles smaller than 40 mesh were quantitated by the barium chloride weight method. The patterns of SOx concentration in the air and soluble sulfur in leaves had a definite realtionship, though the soil sulfur content and the weather must be taken into consideration before using those plants as air pollution indicators. At present, sage brush sampled in East Tomakomai has 0.05-0.08% of soluble sulfur; but in Tomakomai and North Tomakomai, the content ranges 0.25-0.5%. In these areas, visible damages of azalea are noted and in one area, the plant growth is impaired by fluorides. The intake of soluble sulfur in plants is lower in these areas in proportion to the SOx concentration in the air.

37499 **APTIC NO. 59271**

Nouchi, Isamu, Toshio Odaira, and Tadashi Sawada

INFLUENCE OF AIR POLLUTANTS ON PLANT PIGMENTS. *(Taiki osenshitsu no shokubutsu shikiso e no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):309, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 59.)*

The changes in chlorophyll and carotenoid of plants exposed to ozone and sulfur dioxide are reported, after experimental exposures. Potted kidney beans were exposed to 15 pphm of ozone and 45 ppm of SO2; O3 concentration was continuously measured by chemiluminescence and electroconductivity automatic meters. Chlorophyll was extracted by 80% acetone, centrifugally separated, and measured by spectrophotometry. Carotenoid was extracted by methanol and petroleum benzene, separated into the ethanol layer and the benzene layer, the benzene layer being carotene. Carotene and xanthopyll were extracted and measured by spectrophotometry. The result showed that the total chlorophyll of the control group was 1.711 mg/g and the exposed group, 1.512 mg/g; the ratio of chlorophyll d/b was 3.31 for the control group and 1.65 for the exposed group. Carotenoid quantity showed almost no change; but the ratio of xanthopyll/carotene tended to increase.

37500 **APTIC NO. 59284**

Taniyama, Tetsuro and Kazuo Sawanaka

EFFECT OF THE AIR POLLUTION IN YOKKAICHI AREA ON THE DRY MATTER AND GRAIN PRODUCTION OF RICE PLANT. *(Yokkaichi ni okeru taiki osen ga suito no kanbutsu ni oyobusu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):306, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 56.)*

The damages of agricultural produce by sulfur dioxide pollution and the resultant harvest decrease were investigated by experimental exposures. Potted rice plants were placed in groups, in Yokkaichi and in a lightly polluted area of Tsu. A close relationship between the level of sulfur dioxide and the amount of rice harvest was discovered. There were no visible damages on the plants themselves; therefore, the decrease of harvest may be regarded as the result of invisible damage of pollution. Based on this finding, the records of the past 25 years of harvests in the Yokkaichi area and the Tsu area were statistically compared. With the development of the new industrial complex in Yokkaichi, the amount of rice harvest began to decrease compared to the average of the Mie prefecture; the decrease is still continuing. The ratio of harvest decrease and the ratio of the cases of Yokkaichi asthma (new patients) are also closely related.

37501 **APTIC NO. 59875**

Wagner, K.-H. and I. Siddiqi

DEPENDENCE OF THE LEAD CONCENTRATION OF PLANTS ON THE LEAD CONCENTRATION IN THE SOIL. *(Abhaengigkeit des Bleigehaltes der Pflanzen von der Bleikonzentration im Boden). Text in German. Naturiwissenschaften (Berlin), 60(4):200, 1973.*

The lead concentration of vegetables grown in the vicinity of highways and in industrial centers has grown in recent years. The explanation frequently given is that the vegetables are being directly contaminated by the lead-containing aerosols of the atmosphere. The reduction of the lead level by washing is suggested. In cabbage harvested 25 m from a highway, 125 ppm lead were measured in the leaves, and after washing 11.6 ppm; in the innermost nucleus 7.0 ppm and after washing 2.3 ppm were measured. The lead fraction which can be washed off is variable, and the remaining lead concentration is indicative of the resorption capacity of plants for heavy metals. The resorption rate of lead by barley was determined by the Mitscherlich method. Two, 20 and, 40 mg lead were added in form of lead nitrate to 6 kg soil each time. The plant did resorb lead from the soil dependent on the lead concentration in the soil.

1972

37502 **APTIC NO. 59887**

Keller, Theodor

MONITORING THE EMISSIONS OF MUNICIPAL GARBAGE INCINERATORS BY MEANS OF FOLIAR ANALYSES FOR CHLORIDES. *(Ueber die Ueberwachung der Immissionen von Kehrrichtverbrennungsanstalten mit Hilfe von Nadelanalyses auf Chloride). Text in German. Mitt. Forst. Bundesvers., vol. 97:271-279, 1972. 7 refs. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

The rising percentage of chlorinated polymers in municipal garbage leads to increasing concentrations of hydrogen chloride in the stack gases emitted for municipal garbage incinerators. To assess the potential damage posed to forests located near these incinerators, needles from rural forest trees were analyzed during 5 consecutive winters to obtain data regarding the normal chlorine content of foliage and their fluctuations. The following conclusions were reached: the chlorine contents in fresh foliage are higher than in oven-dried foliage; the Cl contents of the needles decrease from the bottom to the top of the crown; the Cl content of the needles tends to decrease slightly with age; on a given site, different species may have different foliage Cl concentrations; the influence of bedrock on the Cl content of foliage is small under conditions of high precipitation; the Cl concentrations in the foliage of a particular tree differs widely from year to year; and distinct and significant increases in the Cl values are found in foliage obtained from areas near garbage incinerators and along highways.

37503 **APTIC NO. 59873**

Kerin, Danimir

FUME DAMAGE OF FORESTS BY THE LEAD AND STEEL INDUSTRY IN THE FORE-ALPS REGION OF YUGOSLAVIA. *(Waldrauchschaeden der Blei- und Stahlindustrie im Voralpengebiet Jugoslawiens). Text in German. Mitt. Forst. Bundesvers., vol. 97:129-139, 1972. 10 refs. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

Pollution damage to the forests in the Fore-Alps region by emissions from nearby lead and iron works was studied. There were large accumulations of lead and sulfur in the soil, and the pine and fir needles investigated exhibited sulfate contents ranging from 0.61 to 1.0% (sulfur values up to 0.33% are considered normal). In addition, over 30% of the samples investigated contained 200 to 1200 ppm iron (normal values ranging from 65 to 190 ppm), and the lead values ranged from 30 to 500 ppm (normal values ranging from 3 to 6 ppm). The sulfur dioxide concentrations in the air over the region averaged between 0.1 and 0.2 ppm, and short-term peaks of 0.5 to 1.5 ppm were observed. Sixty percent of the needle samples from the polluted area gave turbidity test values of over 75, and 30% of the samples gave values between 56 and 75; the average normal value is 29. The chemical values agree with the visible signs of damage in the conifer forest regions investigated.

37504 **APTIC NO. 59947**

Scholl, Gerhard

A BIOLOGICAL METHOD OF DETERMINING FLUORINE COMPOUNDS IN ATMOSPHERIC POLLUTION. *(Ein Biologisches Verfahren aum Nachweis von Fluorverbindungen in Immissionen). Text in German. Mitt. Forst. Bundesvers., vol. 97:255-269, 1972. 15 refs. (Presented at the International Symposium of Forest Fumes Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

A grass culture method for determining the origin and distribution of fluorine compounds in the air has recently been developed. With this method, the accumulation of fluorine in the test plants is used as the measured value. The only plants which are suitable are those which can accumulate the toxic substance in large amounts without showing visible external symptoms of damage or a depression in growth. Certain grasses, such as Lolium multiflorum and L. perenne, are relatively insensitive to fluorine compounds in the air. These indicator plants are placed for a defined period in a standardized growth substrate with comparable nutrient and water supplies in the vicinity of a pollution source. The plant samples obtained at the end of the exposure period are analyzed for their fluorine content. On the basis of the fluorine values obtained (in mg/100 g dry matter), it is possible to assess the origin and distribution of fluorine compounds in the air and to make a prediction of the fluorine hazard to grazing cattle. Details of the method and the results of some practical field investigations are reported.

37505 **APTIC NO. 59259**

Vanin, A. F., A. A. Mutuskin, K. V. Pshenova, E. N. Frolov, D. Sh. Burbaev, and I. L. Lisovskaya

REACTION OF PLANT FERREDOXIN WITH NITRIC OXIDE. *Mol. Biol. (English translation from Russian of: Molekulyarnaya Biologiya), 6(1): 21-25, 1972.*

The reaction of nitric oxide with pea leaf ferrodoxin was investigated. The absorption spectrum of oxidized ferredoxin did not change upon contact of the ferredoxin with NO. Absorption bands characteristic of oxidized ferredoxin in contact with NO and subjected to the effect of weak acid or dithionite. This band is probably due to a complex of NO with cysteine residues. An EPR signal of a nitrosyl complex of iron with cysteine was not found. The data obtained are examined on the basis of a persulfide model of the structure of nonheme iron complexes in ferredoxin. (Author abstract)

37506 **APTIC NO. 59952**

Wood, Francis A. and John B. Coppolino

THE INFLUENCE OF OZONE ON DECIDUOUS FOREST TREE SPECIES. *Mitt. Forst. Bundesvers., vol. 97:233-253, 1972. 21 refs. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

Seedlings of 21 species of deciduous trees commonly found in the northeastern United States were exposed to ozone in dosages of 25 pphm for 4 to 8 hours and to 10 pphm for 2, 4, 6, or 8 hours at 21 C, a relative humidity of 75%, and 1400 ft-c of light. All plants were exposed to 1 hour of darkness prior to fumigation. Symptoms of damage developed on green ash, white ash, sweet gum, pin oak, scarlet oak, white oak, hybrid poplar, mountain ash, sycamore, redbud, honeylocust, and tulip poplar following exposure to 25 pphm ozone for 8 hours. The most common symptoms were stipples of the upper leaf surface, necrotic flecks, overall leaf chlorosis, marginal leaf necrosis, overall leaf necrosis, and tissue collapse. Exposure of these species to 25 pphm ozone for 4 hours injured green ash, white ash, mountain ash, honeylocust, white oak, hybrid poplar, and tulip poplar. Exposures at 10 pphm for 8 hours injured white ash, honeylocust, hybrid poplar, tulip poplar, and sycamore. Symptoms failed to develop on European white birch, gray dogwood, flowering dogwood, little-leaf linden, Norway maple, sugar maple, English oak, red oak, and shingle oak exposed to 25 pphm for 8 hours. The incidence of sensitive plants within the seedling population of each species ranged from 19 to 100%; with the exception of white ash, all species were resistant during the first 2 weeks of growth following bud break in the spring. (Author abstract)

1966

37507 **APTIC NO. 59906**

Applegate, Howard G.

PESTICIDES AT PRESIDIO. II. VEGETATION. *Texas J. Sci., 15(3):266-271, Oct. 7, 1966. 5 refs.*

Data are presented on the concentrations of DDT and phosphorylated pesticides in cotton and leatherstem found at Presidio, Texas. Pesticides could be detected in the leaves prior to their first application in the summer. Leatherstem apparently accumulated the phosphorylated pesticides. The drift and distribution of pesticides in the ecosystem in this area were studied. In the first measurements on June 9, DDT concentrations ran from 0.6 ppm for cotton plants on the periphery of the growing area to 4 ppm in cotton plants in the center of the growing area. Leatherstem leaves in the desert adjacent to the cotton growing area had DDT concentrations of 0.1-0.4 ppm. Three miles from the cotton area they had 0.1-0.4 ppm; 6, 9, 15, and 19 mi out, concentrations of 0.1-0.2 ppm DDT were found. As more DDT was applied during the growing season, more DDT was found in the leaves. When the final vegetation samples were taken during the last week in August, periphery cotton had 2-5 ppm DDT, cotton from the center of the growing area had 5-10 ppm. leatherstem growing next to the cotton had 3-5 ppm, 3 mi out, the leatherstem had 2-5 ppm, 6 and 9 mi out the leatherstem had 1 and 5 ppm, and 15 and 19 mi from the cotton growing area the leatherstem had 0.5-1.5 ppm.

37508 **APTIC NO. 59918**

Petkov, G.

EFFECT OF HIGH AMMONIUM SULPHURATED HYDROGEN AND CARBON DIOXIDE CONCENTRATIONS ON LAYING HENS. *(Vliyaniye povishenite kontsentratsii amonyak serovodorod i v gleroden dvuokis v rkhu kokoshkite nosachki). Text in Russian. Vet.-Med. Nauki, 3(4):351-356, 1966. 10 refs.*

Experiments were conducted to study the effect of high ammonia, hydrogen sulfide, and carbon dioxide concentrations on layer hens. Hens of the experimental groups were housed for 2 mo in a pen with air containing 0.052-0.08 NH_3, 0.080-0.1% H_2S, and 0.5-0.9% CO_2. Control hens lived in well-ventilated pens under similar conditions. After 2 mo, a drop of 9% in egg production occurred in the hens living in the polluted air. A decrease in the hemoglobin content from 9.86 to 7.28% and a reduction in the number of erythrocytes from 2.54 million to 1.6 million also occurred. The hens raised in the polluted atmosphere also showed an increased respiration rate from 37-40 to 52-76 per minute.

1965

37509 **APTIC NO. 59935**

Crocker, Thomas D.

IN POLK AND HILLSBOROUGH COUNTIES, FLORIDA. *Bull. At. Sci., 1965:17-19, June 1965.*

Air pollution in the citrus growing area in Polk and Hillsborough counties, Florida, is described. This area has one of the world's largest and richest phosphate deposits, and therefore a large phosphate industry grew in the area. It supplies over 75% of the nation's phosphate rock. Expanded food and fiber production in the area caused removal of most of the phosphorus in the soil used for agriculture. Therefore fertilizers such as triple superphosphate were applied in the area. This resulted in increased fertilizer production at the phosphate plants, and thus, increased air pollution due to fluorides. Cattle in the area were affected by fluorosis, and citrus showed chlorosis due to the gaseous fluorides. Some areas generally had concentrations of 10 ppb fluorides in the air. The air pollution was worse in the winter and early spring; these months also had the greatest occurrence of cattle and citrus damage. Due to combined governmental and industrial efforts, fluoride emissions were reduced from 33,000 pounds/day (winter of 1961-1962) to 13,000 lbs/day (winter of 1963-1964). Since 1959, air pollution control equipment costing $16 million has been added. A new, pollution-free plant costing $20 million replaced an old one. A new proposal is being considered to limit fluoride emissions further.

1962

37510 **APTIC NO. 59931**

Krueger, Albert P., Sadao Kotaka, and Paul C. Andriese

STUDIES ON THE EFFECTS OF GASEOUS IONS ON PLANT GROWTH. I. THE INFLUENCE OF POSITIVE AND NEGATIVE AIR IONS ON THE GROWTH OF AVENA SATIVA. *J. Gen. Physiol., vol. 45:879-895, 1962. 30 refs.*

Exposure of Avena sativa (oat) seedlings to unipolar ionized atmospheres of either charge produced a statistically significant stimulation of growth as measured by stem length, integral elongation, and dry weight. The extent of growth increase was related to the atmospheric ion density. This in turn determined the magnitude of current flow to ground. The minimal current measured in the ground circuit capable of producing a measurable difference in growth was 4.3 to 4.6 times 10 to the -13 amps/plant. (Author abstract)

EFFECTS-MATERIALS

1974

37511 **APTIC NO. 59423**

Riederer, Josef

POLLUTION DAMAGE TO WORKS OF ART. *Experientia Suppl., no. 20:73- 85, 1974.*

Damage to works of art by air pollution and methods for restoration and preservation are examined. Sulfur dioxide in combination with humidity and dust is mainly responsible for damage to works of art exhibited outdoors. Buildings and sculptures made of natural stone are seriously threatened by sulfur dioxide pollution since it is capable of transforming calcite into gypsum which is rapidly worn down by weathering. Products have been developed in France which transform the SO2 in polluted air or already formed sulfates into insoluble compounds. More serious than the corrosive action of SO2 is the damage caused by soot which settles on the surfaces of stone. Sulfur dioxide, sulfates, and soot are also capable of destroying the paint layer of wall paintings. Painted glass windows have suffered serious damage as a result of dust and SO2 contamination, while pieces of bronze sculpture have suffered serious destruction as a result of soot. Copper sulfates which have been consistently found on the surface of bronze demonstrate that the corrosion is due to attack of airborne SO2. The lead of bronzes is transformed into lead sulfate. Gypsum, when deposited on bronze, bakes together the corrosion products, dust, and soot rich in aggressive compounds. Future damage to bronzes may be prevented by the application of synthetic resin coatings.

37512 **APTIC NO. 59884**

Riederer, Josef

STONE DECAY EVEN WITHOUT FLUE GAS. *(Steinschaeden auch ohne Rauchgas). Text in German. Umwelt (Duesseldorf), 4(1):42-43, 1974.*

Studies concerning the effect of air pollutants on monuments and buildings are discussed. Air pollution may not contribute much to deterioration. Studies in Southern Bavaria revealed that the decay of buildings and monuments is as bad in areas with sulfur dioxide concentrations below the detection limit as in cities. The decay of sandstone was due to a loosening of its structure rather than to a conversion of its components. Temperature and frost have a decisive influence on the loosening of sandstone. Gypsum crusts which are usually considered as proof for a reaction of SO2 with the calcium of the stone, can be far better explained by dust deposits. Because of the fine dust and the fraction of catalytically active substances, a conversion of the calcium fraction to gypsum is feasible. Another fact which speaks for a natural weathering rather than the influence of air pollutants is the decay of the cathedral in Cologne which had progressed so far by 1800 that a famous architect of the time was called in to have a look at the extensive damages.

1973

37513 **APTIC NO. 59419**

Kadoi, Morio

THE RELATIONSHIP BETWEEN METAL CORROSION AND AIR POLLUTION IN TOKYO. *(Tokyo-to ni okeru kinzoku fushoku to osen to no kankei). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), no. 11:14-20, 1973. 3 refs.*

The meteorological factors contributing to the material damages by air pollution, such as the rain quantity, dew, temperature, humidity, and air pollutants such as sulfur oxides, chlorides, settling particles, and combinations of various pollutants are discussed. The correlations between air exposure corrosion and environmental factors were examined by exposure measurements. Tests were conducted at three industrial areas, two commercial areas, one residential area, and one agricultural area of Tokyo, and pollutant measurements were taken simultaneously. The meteorological records were obtained from the Tokyo Weather Observatory. The monthly corrosion progress and measurements of SO2, Cls, and settling particles are presented. Corrosion of carbon steel is most serious in industrial areas, and less in commercial, residential, and agricultural areas, respectively. Measurements taken at altitudes of 25 and 225m of the Tokyo Tower (commercial area) showed that the corrosion at 225m was very heavy, showing heavy pollution of the upper atmosphere. Whether this is the result of rusts peeling off by wind friction, or the effects of high stacks is not clear. The degrees of monthly corrosion show that damages in winter are lowest, in the rain and typhoon season the highest, and in summer are about the middle. Strong correlations between corrosion and the temperature, humidity, sunshine rate, rainwater electroconductivity, and SO2 exist. Correlation with Cl depends on the area. Simple exposure tests were conducted at 50 locations of Tokyo and the results were checked in 3, 6, 9, and 12 months. Sulfur dioxide concentrations and corrosion ratings were indicated in a map, and heavy corrosion areas and heavy SO2 pollution areas coincided generally.

37514 **APTIC NO. 59600**

Kamiyama, Keizo

AIR POLLUTION AND THE CORROSION OF METALS. *(Taiki osen to kinzoku no fushoku). Text in Japanese. Kinzoku Hyomen Gijutsu (J. Metal Finish.), no. 11:1-7, 1973.*

It is generally believed that a minimum amount of humidity is necessary for metal corrosion in the atmosphere, even in heavily polluted areas. For soft steel, the minimum humidity for corrosion to take place is 60%, and for aluminum, 80%, and for copper and zinc, there is no minimum conditions. As a result of exposure tests conducted at 16 locations in Japan, Al was fairly stable in any condition. The locations included cold areas, cities, industrial areas, rainy and snowy areas, pastoral environments, shore industrial areas, particularly humid areas, and indoors. In polluted areas such as Tokyo, Osaka, Yokohama, and Niihama, black and brown discoloration of aluminum occurred, but there was no chemical change involved. However, an experiment of exposing 0.009 mm aluminum foil on an airplane wing at the height of 2000 m for measuring cloud particles accidentally revealed heavy pollution in the upper sky and its effect on aluminum. The foils exposed in the air of the upper sky of Utsunomiya was completely corroded and changed into bayerite. An x-ray fluorescence analysis showed the effects of an unusually high amount of sulfur and chloride. Hydrogen chloride from incinerators and ethylene chloride used in automobile engine as a lead eliminator had much to do with the unusual amount of Cl in the sky of Utsunomiya.

37515 **APTIC NO. 59960**

Sakae, Yukio

AIR POLLUTION AND METAL CORROSION. (6) EFFECT OF AIR POLLUTION ON OUTDOOR STRUCTURES. FOR CHEMICAL PLANT AND POWER FACILITIES. *(Taiki osen to kinzoku fushoku shirizu. (6) Okugai kozobutsu no taiki osen ni yoru eikyo. Kagaku puranto, denryoku shisetsu nado no baai). Text in Japanese. Bosei Kanri (Rust Prev. Contr.), 17(8):11-15, Aug. 1973. 7 refs.*

The rate of corrosion of steel used for industrial buildings is discussed in relation to the pollutants emitted by the source. Facilities attached to a chemical plant, such as storage tanks, frames, and pipes, must be protected by a thick coating of highly resistive resin. Power plants must use zinc-plated stainless steel with resin coatings to protect against damage by salts. The resistivity of zinc-plated steel is 40-90 times greater than that of soft steel. The lifetime of a 90 micron coating of zinc on stainless steel is about 35 yr in coastal areas, and it is half that in a coastal industrial area. Clear vinyl coatings must be used on transmission wires.

1972

37516 **APTIC NO. 59923**

Shimosato, Shoichi

EFFECT OF H2S ON CONTACTS. *Electron Commun., Japan, 55C(3): 73-79, 1972. 9 refs.*

The effect of hydrogen sulfide on electrical contacts made of precious metals was investigated by exposing the contacts to a static H2S atmosphere, subjecting them to make and break actions, and measuring contact resistances and surface film thickness and composition. The effect of the gas was smallest on gold contacts; sulfurization occurred in the case of platinum, palladium, and gold due to make and break actions. Silver contacts showed the highest increase in contact resistance after static exposure to the gas; although the resistance was not very high after make and break actions, perhaps resulting from the facility of the silver sulfide film for mechanical breakage. (Author abstract modified)

EFFECTS-ECONOMIC

1974

37517 **APTIC NO. 60298**

Gillette, Donald G.

AGRICULTURAL LOSSES AND ASSESSMENT OF AIR POLLUTION DAMAGE. *Preprint, Virginia Polytechnic I t., Blacksburg and Univ. of Puerto Rico, Rio Piedras (Puerto Rico), 14p., 1974. 11 refs. (Presented at the Air Pollution Workshops, Blacksburg, Va., March 4-6, 1974 and Rio Piedras, Puerto Rico, March 13-15, 1974.)*

Estimated losses from air pollution damage to vegetation in the United States range from less than $100 million to more than $500 million per year, and approximately 80% of the estimated damage is attributed to oxidants. Damage from sulfur oxides and fluorides accounts for about 10%, and about 10% of the total loss can be charged to other miscellaneous pollutants. Over one-third of the total loss is associated with damages to ornamentals and shrubs in heavily polluted urban areas, while the remaining losses of approximately $100 million are incurred by commercial crops grown in urban fringe areas or around major rural point sources. Over half of the estimated vegetative losses from air pollution in the United States occur in the state of California. The opportunity costs incurred by farmers as a result of pollution infringement on their productive capabilities are extremely difficult to quantify because of the intangible nature of the value or cost of the opportunities lost.

37518 **APTIC NO. 60336**

Gillette, Donald G.

SULFUR DIOXIDE STANDARDS AND MATERIAL DAMAGE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 26p., 1974. 19 refs. (Presented at the Air Pollution Control Annual Meeting, 67th, Denver, Colo, June 9-13, 1974, Paper 74-170.)*

Estimates were made of the percentage of the total population and materials exposed to different annual average ambient sulfur dioxide levels and of the amount of material damage attributed to these exposures during the period of 1968-1972 in the United States. The amount of material damage from SO2 decreased from $900 million to about $75 million according to the damage function data and paralleled sharply diminished SO2 levels. Not one of more than 200 monitoring sites reported concentrations that exceeded the primary standard during 1971 and 1972, and less than 5% of the population in the United States was exposed in areas where the secondary standard (60 micrograms/cu m) was being exceeded. Most of the present loss appeared to be from corrosion to painted and unpainted surfaces that were normally exposed to the environment. The economic damage threshold (the pollution level at which such damage occurred) for other materials tended to be greater than those ambient levels observed. (Author abstract modified)

37519 **APTIC NO. 59392**

Hoedl, Erich

NEW ECONOMICAL ASPECTS OF AIR POLLUTION. *Experientia Suppl., no. 20:87-94, 1974. 11 refs.*

Traditional economic theory is inadequate for the solution of air pollution problems and the solution according to ecological principles must occur within a global socio-economic strategy by problem-oriented planning processes on the level of active decision making. Switching from economic theory to political economy is viewed as a way of removing strategical problems on the level of society and contributing to environmental planning on a decision-making level.

37520 **APTIC NO. 59345**

Uhlig, Christoph Andreas

AIR POLLUTION, AIR CONSERVATION AND INTERNATIONAL ECONOMIC RELATIONS. *Experientia Suppl., no. 20:95-106, 1974. 6 refs.*

The connection between air pollution and international economic relations is examined, and a very simplified economic model is developed to show that internationally differing stringency of measures for air conservation can induce various international economic flows which may have undesired ecological results. National measures against air-polluting production processes may influence not only the international flow of products and capital but may also induce the transfer of polluting industries to countries with less stringent measures. The environmental problem cannot be dealt with on the basis that stringent air conservation measures are unnecessary in low-populated or economically less-developed countries since economic movements may set in to such an extent that great efforts would be required to remove the results of pollution from such countries. A more integrated approach is required which considers the interrelationships in complex ecological systems, the adjustments in dynamic economies, and the concrete socio-economic situations.

1973

37521 **APTIC NO. 59245**

Easton, J. C. and H. M. McFarlane

ECONOMICS OF PULP AND PAPER POLLUTION ABATEMENT. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 701-737, 747-748. 40 refs. (May 7-11.)*

The costs of air pollution abatement in the pulp and paper industry is discussed in a report on the economics of environmental pollution control. The analysis is limited to airborne particulate matter and odorous gases from a large bleached kraft pulp mill. The capital costs are estimated at $1,235,000 and include provisions for a 99.5% efficiency electrostatic precipitator, scrubbers, a multistack dust collector, a recovery boiler, a black liquor solids concentrator, and equipment for the combustion of gases and the treatment of condensate. The annual operating cost is estimated at $66,000 or $0.96/ton. These costs apply to the construction of a new mill. In the case of an existing mill, the cost for air pollution abatement could be considerably higher. The estimated cost of air pollution abatement in the sulfite industry would be lower than in the sulfate industry and figures at about $0.30/ton.

37522 **APTIC NO. 59714**

Farmer, M. H.

LONG RANGE MARKET PROJECTIONS FOR BY-PRODUCTS OF REGENERABLE FLUE GAS DESULFURIZATION PROCESSES. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73-038, p. 891-919. (May 14-17.)*

A quantitiative study using a computer model to simulate various abatement schedules and to project the supply/demand/price implications of these schedules up to the year 2020 was performed to provide the Environmental Protection Agency with a planning tool for establishing the relative priorities that should be given to the development of technology for recovery of abatement sulfur in marketable and non-marketable forms. The years 1980 and 2000 illustrate the results of the computer calculations. West Canadian sulfur is expected to be at peak levels and backstopped by huge stockpiles in 1980; world markets will be under intense supply pressure; and the fitting of abatement systems in the United States should be beyond the demonstration stage into widespread use. Two decades later, Canadian sulfur will be a minor factor in world markets; sulfur recovered from petroleum refining will be of major importance; and abatement policies in the United States will have determined the shape of domestic sulfur and sulfuric acid industries and their relationship to world markets. The structure of the domestic sulfur acid industry suggests that in the near term it will be essential for many power stations to recover or remove sulfur in forms other than acid. The market for SO2 is small, and that for ammonium sulfate is declining. Hence, apart from using low sulfur fuels, the only broadly applicable choices appear to be elemental sulfur and waste gypsum.

37523 **APTIC NO. 59715**

Fike, H. L. and J. S. Platou

NEW USES FOR SULFUR- THEIR STATUS AND PROSPECTS. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, Flue Gas Desulfurization Symp., Proc., New Orleans, La., 1973, ROAP 21ACY-30, EPA-650/2-73- 038, p. 921-929. (May 14-17.)*

New use markets for the elemental sulfur recovered from coal as a result of air pollution abatement regulations are outlined in terms of their status and prospects. Such new areas of application include: sulfur-asphalt paving materials; sulfur concretes; sulfur bond construction; sulfur as a coating material; sulfur impregnation of ceramic and other porous materials; and sulfur foams which show excellent thermal insulation properties. These uses, if developed commercially, could absorb the foreseeable supply of sulfur. They fulfill the criteria of being potentially large volume uses, and they are ecologically acceptable. They also appear to have favorable economics, and the time and cost needed for commercial development do not appear excessive.

37524 **APTIC NO. 60337**

Seidel, Marquis R., Steven E. Plotkin, and Robert O. Reck

ENERGY CONSERVATION STRATEGIES. *Environmental Protection Agency, Washington, D. C., Office of Research and Monitoring EPA-R5- 73-021, Program Element 1H1093, 120p., July 1973. 24 refs.*

GPO

A socioeconomic report on various strategies for reducing national energy demand is presented. Short-term, mid-term, and long-term strategies are examined for the residential/commercial sector, the industrial sector, and the transportation sector. Basic strategy options considered are: demand reduction by modifying energy-wasteful government policies, internalizing environmental costs to users, or assisting the market-place on a selective basis; supply increase by relaxing environmental constraints and by government funding of research and development; and finally no action (leaving a gap between supply and demand). The use of added insulation in the residential/commercial sector, even at current energy prices, would pay for itself in most cases; and a 25% increase in fuel costs could make it economical to save 50% of the residential heating/cooling needs in new units and about half that amount in existing units. Options for industrial savings include more recycling of energy-intensive materials, use of energy-saving materials in manufacturing and construction, and investment in energy-saving processes and equipment. Greater savings for the short term in the transportation sector are available from increased auto efficiency rather than from shifting to alternative modes of passenger travel. It is desirable, however, for the longer term to reverse the trend to less energy-efficient modes of transport. Auto owners need to become more aware of fuel-saving options such as better load-to-engine match and smaller cars. Planning for urban transport systems might consider energy conservation along with abatement of congestion and pollution.

1972

37525 **APTIC NO. 59569**

Arge, Ralph C. d

ECONOMIC GROWTH AND THE NATURAL ENVIRONMENT. *In: Environmental Quality Analysis. A. V. Kneese and B. T. Bower (eds.), Baltimore, John Hopkins Press, 1972, Chap. 1, p. 11-34. 22 refs.*

The relationship between economic growth and the natural environment is discussed, and a series of pardadigm are developed to relate the two in terms of resource extraction and waste emissions or accumulation. Conjunctive utilization of the environment is briefly analyzed. The hypothetical economy can achieve an optimum path of consumption and period of survival only by imposing regulations on both extraction of natural resources and waste disposal that reflects the natural environment s presumed finite waste holding capacity and the availability of extractive resources. Policies with regard to resource extraction indirectly affect the magnitude of waste flows and cannot be separated from policies attempting to regulate environmental pollution. The population was treated in each model as exogeneously determined, and increasing at a constant rate. In terms of a closed resource system, it appears essential to curb population growth at some point or to treat it as endogeneous variable and derive optimal population levels for each period. A viable population, even at subsistence standards of living, will usually cause some amount of waste accumulation. (Author summary modified)

37526 **APTIC NO. 59470**

Organization for Economic Cooperation and Development

ON GUIDING PRINCIPLES CONCERNING INTERNATIONAL ECONOMIC ASPECTS OF ENVIRONMENTAL POLICIES. *Preprint, Organization for Economic Cooperation and Development, Paris (France), 4p., June 6, 1972. (Presented at the Organization for Economic Cooperation and Development, 293rd Meeting, May 26, 1972.)*

Guiding principles concerning the international economic aspects of environmental policies are described as adopted by the Council of the Organization for Economic Cooperation and Development. The principles apply to the following areas: cost allocation (polluter-pays principle); environmental standards; national treatment and nondiscrimination; procedure for control; and compensation import levies and export rebates.

37527 **APTIC NO. 59570**

Commins, (J. A.) and Associates, Fort Washington, Pa.

GROUP BUYING TO REDUCE AIR POLLUTION COSTS FOR SMALL PLANTS. *359p., Aug. 1972. 60 refs.*

The possibility was examined for reducing the costs, procurement risks, and time delays associated with individual action for implementing air pollution control measures by using the economies ensuing from having several industrial establishments act in uniform fashion with respect to the specifying, purchasing, and even financing of air pollution control equipment. The study focused on industries with a large complement of small businesses, because these could expect to experience a disproportionately heavy economic impact. If uniform action proves economical, this would tend to reduce the overall national cost of attaining clean air standards and thereby achieve a more efficient utilization of resources to clean up the environment. The secondary non-ferrous metallurgical, asphalt batching, lime, and grain and grain handling industries were chosen for study. The type and source of pollution, present control technology, necessary process controls or changes, and secondary effects from these changes are tabulated for each industry. The costs for the recommended actions are related to process variables. Air quality standards guide the recommended actions.

1971

37528 **APTIC NO. 59567**

Crossley, Surveys, Inc.

REPORT ON AIR AND WATER CONSERVATION EXPENDITURES OF THE PETROLEUM INDUSTRY IN THE UNITED STATES 1966-1970. *American Petroleum Inst. Pub-4075, 33p., Feb. 1971.*

The results of surveys of the air and water conservation expenditures of the U. S. petroleum industry from 1966 to 1970 are given. Completed questionnaires were received from 45 companies, representing 98.3% of the industry s crude oil charge per calendar day (10.7 million barrels). The reported daily industry average was 10.9 million barrels. A sample questionnaire is included. During the 5-year period covered by this survey, the petroleum industry spent in excess of $2 billion on air and water conservation. Total expenditures increased an average of 20%/yr during this period. Total expenditures for air increased by more than 100% in the period. The capital dollar outlay during 1966-1970 amounted to more than 60% of the total air and water conservation expenditures, or $1.23 billion. Capital expenditures increased an average of $40 million/yr, reaching $348.5 million in 1970. Operating and maintenance expenditures were $518 million; they increased an average of $11 million/yr. Administrative expenses amounted to $147.6 million for the period; they increased by nearly 100%/yr. Research and development expenditures were $139.2 million. The industry also spent an additional $14.2 million to support the research studies sponsored by the American Petroleum Institute S Committee for Air and Water Conservation. In 1970, 86% of every research dollar was spent for air pollution research.

STANDARDS AND CRITERIA

1974

37529 **APTIC NO. 59869**

Falkowski, Tomasz

ENVIRONMENTAL PROTECTION AND RESPONSIBILITY IF EXISTING STANDARDS ARE BROKEN. *(Umweltschutz und Verantwortung bein Verletzungen der bestehenden Normen). Text in German. VDI Ver. Deut. Ingr.) Z. (Duesseldorf), 116(4):P5-P7, March 1974.*

Rules and standards regarding environmental protection in the People s Republic of Poland are worked out by central governmental institutions. In 1966, the Polish Sejm passed a law detailing all tasks of industrial complexes for the protection of the atmosphere. Based on this law, the maximum allowable concentrations of pollutants in the atmosphere were issued for a total of 200 substances. A distinction is made between specially protected and protected areas. For instance, for specially protected areas, the average diurnal concentration of sulfur dioxide is limited to 0.075 mg/cu m, in protected areas to 0.35 mg/cu m. All industries which emit substances have the task of measuring the emissions at the plant, in the neighborhood, and in certain protectinz zones. The number of measuring stations is determined by the government agency concerned with air pollution. If maximum allowable emission concentrations are exceeded, measures for reduction of the missions can be demanded; if within a certain period of time the demands are not met, the operating license can be withdrawn. Also, fines can be imposed if standards are exceeded.

37530 **APTIC NO. 59846**

Hotzel, E.

THE USE OF HARD COAL IN THE POWER PLANT AND CONSERVATION OF CLEAN AIR. *(Steinkohlenverwendung im Kraftwerk und Luftreinhaltung). Text in German. VGB Kraftwerkstechnik, 54(2):69-75, Feb. 1974. 9 refs.*

All important regulations concerning the conservation of clean air which affect industrial plants (including power plants) requiring an operating license are contained in the Technical Directives for the Conservation of Clean Air (TA Luft). The Technical Directives are administrative regulations which will receive legal authorization through the Federal Emission Protection Law. The main target of the law is the prevention of all damaging effects of environmental pollutants. The law also requests the participation of the public in the licensing process. Regulations affecting existing plants will be put on a legal basis by the Emission Protection Law. From industrial enterprises whose selected location requires the consent of the municipal authorities, the law permits that protective measures can be demanded which far exceed the legal requirements. The presently valid limit values for dust shall be reduced by the new law to 0.35 mg/sq m day (long-term limit value) and to 0.65 mg/sq m day (short term limit value) and for sulfur dioxide to 0.40 mg SO2/cu m air (short-term value) and 0.14 mg SO2/cu m air (long-term value). If emission measurements yielded long-term concentrations of SO2 of 0.06 to 0.14 mg SO2/Cu m air, the stack height calculation must include the factor K which will lead to considerably higher stacks. In many industrial areas these short term values are presently exceeded which means that no fossil fuel-fired power plants can be erected there until the short-term emission concentration is brought down. The intended limits for dust and SO2 are almost prohibitive for the erection of new hard coal-fired power plants. It is recommended therefore the new limit values be abandoned and that the location of new plants be discussed with state planners instead.

37531 **APTIC NO. 59880**

Shtabsky, B. M.

AN EXPRESS METHOD FOR HYGIENIC STANDARDIZATION OF CHEMICALS. *(Ekspress-metod gigiyenicheskogo normirovaniya khimicheskikh veshchestv). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 1:23-28, 1974. 16 refs.*

The essence of the method for hygienic standardization of chemicals is appraisal of the cumulative ability of substances with reference to the half-life of the effect with subsequent calculation of hygienic standards by a special scale. To the weak, medium-strong, strong, and very strong cumulative abilities correspond the maximum permissible concentrations in the atmosphere of working areas of 0.005, .003, 0.0002, and 0.00004 mg/Mach/l LC50, respectively. The ineffective doses with peritoneal administration correspond to 0.0025, 0.0005, 0.0001, and 0.00005 mg/Machs/kg, LD50, respectively. The average diurnal maximum permissible concentrations in the atmospheric air equal 1/10th of the allowable concentrations in the air of working areas.

37532 **APTIC NO. 59866**

Dutch Committee for the Prevention of Disasters by Hazardous Substances, Subcommittee on Toxicity

PUBLIC EMERGENCY LIMITS. *Staub, Reinhaltung Luft, 34(3): 85-87, March 1974. 2 refs.*

Recommendations were issued concerning Public Emergency Limits (PEL) for the substances acetonitrile, acrylonitrile, allychloride, ammonia, chlorine, ethylene oxide, and phosgene. The PEL for these substances were set for exposure periods by the general public of .5, 1, 2 hr assuming that the contamination of the air returns to normal within 2 hr. For establishing PEL, four levels of effects were distinguished, firstly, increased mortality, secondly, symptoms or signs of illness, either caused or aggravated by exposure, which are irreversible or slowly reversible (more than a few days), thirdly, symptoms of sickness (including serious discomfort), which in themselves may be unpleasant, but which appear to be quickly reversible, and finally, effects which impede self control or coordination and adequate action. Only the effects under point three were considered permissible. For ammonia the recommended PEL are 50 ppm (half hour), 25 ppm for 1 and 2 hr exposures, for chlorine they are 1.5 ppm and 1.0 ppm, resepectively.

1973

37533 **APTIC NO. 59417**

Barth, D. S., F. G. Hueter, and J. Padgett

AIR QUALITY STANDARDS-SETTING. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Dept. of Transportation, Washington, D. C., Environmental Protection Agency, Washington, D. C., Inst. of Electrical and Electronic Engineers, New York, Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Rockville, Md. Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 169-176. (Dec. 10-12, Paper ISA JSP 6685.)*

A brief summary of the provisions of the Clean Air Amendments of 1970 relating to regulatory authorities is presented. Considerable detail is given concerning the scientific documents required to serve as a foundation for setting air quality standards. Particular attention is given to the difficulties inherent in translating state-of-the-art scientific knowledge into regulatory standards. Problems associated with defining the most sensitive population at risk and estimating an adequate safety margin to assure public health protection are addressed. The roles of the National Air Quality Criteria Advisory Committee in assembling the required supporting data for setting standards are discussed. The underlying importance of verified measurement accuracy to all of the above is emphasized. National ambient air quality standards, performance standards for new stationary sources, stationary source emission standards, fuel and fuel additive standards, and aircraft and motor vehicle emission standards are discussed. Research efforts by the EPA include documentation in the areas of epidemiology, carbon monoxide, oxidants and their synergistic effects, measurement of nitrogen oxides, atmospheric photochemistry, and dispersion and washout of pollutants.

37534 **APTIC NO. 59431**

Bertin, Michel and Michel Sommer

AIR QUALITY STANDARDS, THEIR SIGNIFICANCE AND LIMITS. *(Normes de qualite de l air. Leur signification et leurs limites). Text in French. Rev. Gen. Thermique (Paris), 12(142):905-910, Oct. 1973.*

Problems and significance of air quality standards and emission standards are discussed. Standards and regulations aimed at reducing pollutant emissions, e.g., by reducing the gasoline lead content, the sulfur content in fuels and in flue gases, and of the carbon monoxide and hydrocarbon contents in automotive exhaust gases, usually disregard such factors as the transformation of pollutants with the environment, and interactions between the pollutants themselves, and atmospheric dispersion. Such factors are considered in air quality standards, setting maximum allowable pollutant concentrations at ground level. The value of such air quality standards, determined in experiments and via epidemiological surveys, is lessened by the limited knowledge of all possible effects of air pollutants and their combinations on the living organism of the synergism of a multitude of pollutants under different conditions, and by the limited applicability of toxicological data obtained in animal tests to the human organism. The disagreement on the definition of thresholds of pollutants further reduces the value of air quality standards. While some scientists advocate zero tolerance for all air pollutants, the highly exacting standards adopted in the USSR are based on such criteria as modifications in biochemical, subsensorial, and electroencephalographic reactions, and U. S. air quality standards are based on measurable modifications in the functions of diverse organs and changes in health status and behavior.

37535 **APTIC NO. 59940**

Hoegger, D.

PLANNED REGULATIONS CONCERNING MOTOR VEHICLES. *(Kuenftige gesetzliche Bestimmungen fuer Motorfahrzeuge). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:381-383, 1973.*

Switzerland will adopt the regulations by the United Nations Organization s European Economic Commission concerning automobile exhaust gas emissions and exhaust control devices for automobiles. A comparison of these European regulations with the U. S. standards shows that the latter are comparable regarding small and compact vehicles with the European regulation, and that it would be illogical for Switzerland as a single European country to adopt the U. S. standards which are based on tests quite different from those used in Europe. According to the European regulations, the exhaust carbon monoxide emissions and the crankcase hydrocarbon emissions will be limited to 4.5%, and 0.15% of the fuel consumption, respectively.

37536 **APTIC NO. 60270**

Kato, K.

REGULATION FOR NITROGEN OXIDES EMISSION. *(Chisso sankabutsu no haishutsu kisei). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(11):17-20, Nov. 1973.*

Air quality criteria for nitrogen oxides have been established and regulations for vehicle exhausts provided. Regulations are also set forth for stationary sources. Determination of NOx should be based on the amended table-1 in Japan Industrial Standards 0104. Regulations are based on measurements made on many industrial emission sources including power station boilers, furnaces for metals and petroleum, and nitric acid manufacturing plants.

37537 **APTIC NO. 60180**

Schulte, H. J.

MAXIMUM ALLOWABLE EMISSION CONCENTRATIONS FOR 20 SUBSTANCES. TARGET CONCENTRATIONS FOR THE AIR. *(Maximale Immissions- Konzentrationen fuer 20 Stoffe erarbeitet. Zielwerte fuer die Luft). Text in German. Umwelt (Duesseldorf), 3(6):37-38, 1973.*

The term maximum allowable emission concentration is defined, and the new maximum allowable emission concentrations worked out for 20 substances are listed in a table. For carbon monoxide the maximum allowable average emission concentration over 24 hours is 10 mg/cu m; for lead 0.002; for sulfur dioxide 0.3; for sulfuric acid 0.1; for nitrogen dioxide 0.1; for nitric oxide 0.5; for nitric acid 0.1; for ammonia 1.0; for hydrogen fluoride 0.1; for sodium fluoride 0.2; aluminum fluoride 0.3; for cryolithe 0.3; for calcium fluoride 0.5; for ozone 0.05; for airborne dust of less than 10 micron 0.1; for zinc 0.1; for tetrahydrofuran 60; for trichloroethylene 5 mg/cu m; and for methylene chloride 50 mg/cu m. For cadmium only an annual average standard has been set which is less than 0.00005 mg/cu m.

37538 **APTIC NO. 59909**

AIR POLLUTANT CONCENTRATION STANDARDS. *(Immissionsgrenzwerte). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:365-374, Dec. 1973.*

General problems of the establishment and application of air pollutant standards, combining limitations of pollutant concentrations with such of durations, are discussed. Pollutant standards have been set in most countries for only a few pollutants, mainly sulfur dioxide, dust, soot, and carbon monoxide, which reduces the practical value of such standards in pollution abatement. While pollutant standards are well applicable for the assessment of certain cases, i.e., for stack height calculation, planning and design, and in the settling of complaints, they are based on rather doubtful principles. Safety standards, setting tolerable concentrations on the basis of biological effects are problematic due to divergencies in the interpretation of biological effects and symptoms. Other standards aiming at preventing pollutant concentrations from increasing further are less problematic since they are set on the basis of practical experience concerning the effect of pollutants on the human organism.

1971

37539 **APTIC NO. 59480**

Stopinski, Orin W.

NEW FEDERAL AIR QUALITY STANDARDS. *Aerospace Medical Research Lab., Wright Patterson Air Force Base, Ohio, Air Force Contract F33615-70-C-1046, Proj. 6302, Rept. No. AMRL-TR-71-120, Paper No. 17, 22p., Dec. 1971.*

NTIS, DDC: AD 751439

The bases and procedures for establishing air quality standards are considered along with proposed and final National Primary and Secondary Ambient Air Quality Standards for sulfur dioxide, particulate matter, carbon monoxide, nonmethane hydrocarbons, photochemical oxidants, and nitrogen dioxide. A discussion follows with questions and answers concerning toxicological evaluation of volatile halogenated compounds, protection of the public against air pollution, and toxicological problems associated with aircraft, missiles, and space vehicles.

1970

37540 **APTIC NO. 60314**

Zuallaert, W.

MAXIMUM PERMISSIBLE DUST CONCENTRATIONS AND DUST MEASUREMENT TECHNIQUES. *(Maximum toegelaten stofconcentraties en technieken van stofmeting). Text in Dutch. Kul Leuven, no. 5:83-91, 1970.*

The maximum allowable workplace concentrations of silicogenic dusts and techniques available for the determination of the dust concentration in the U.S.A. are described. Since free crystalline silica alone is regarded as being silicogenic, the maximum allowable concentrations of silicogenic dusts are a function of their free crystalline SiO2 contents. The total maximum allowable concentrations of dusts with 100%, 50%, 10%, and 1% of quartz are set at 0.3 mg/cu m; 0.6 mg/cu m; 10 mg/cu m, and 15 mg/cu m, while the respective limits of their respirable fractions are 0.1 mg/cu m, 0.2 mg/cu m, 0.8 mg/cu m, 3.3 mg/cu m, and 5 mg/cu m. The maximum allowable concentrations of tridymite and cristobalite are reduced by 50%. The maximum allowable asbestos fiber concentration is set at 12 fibers/ml. While U. S. experts prefer the impinger method to any other method of dust measurement, the konimeter test is extensively used in both South Africa and West Germany, and the thermal precipitator technique is adopted in Great Britain. The silica content in silicogenic dusts can be determined by Cartigny s chemical method, by x-ray diffraction, and by phase-contrast microscope.

1969

37541 **APTIC NO. 59943**

World Health Organization, Geneva (Switzerland), Joint International Labor Office/WHO Committee on Occupational Health

PERMISSIBLE LEVELS OF OCCUPATIONAL EXPOSURE TO AIRBORNE TOXIC SUBSTANCES. *World Health Organ. Tech. Rept. Ser., no. 415:1-16, 1969. 6 refs.*

Permissible levels of occupational exposure to airborne toxic substances were set at a meeting. The principles for defining these limits include consideration of the biological effects, the conditions in developing countries, and the safe concentration zones recommended for international use. The biological indicators of environmental exposure and the assessment of occupational exposure are reviewed. The criteria used to determine the permissible limits are organic, functional, biochemical, and miscellaneous effects. Safe concentration zone limits recommended for international adoption in mg/cu m were 5-7 hydrogen chloride, 0.4-0.5 phosgene, 10-15 hydrogen sulfide, 10-13 sulfur dioxide, 1 sulfuric acid, 0.1-0.2 ozone, 20-35 ammonia, 0.2-0.3 arsine, 1000-2000 ethanol, 20-35 methyl acrylate, 3-5 nitrobenzene, 1 dinitrobenzene, 1-1.5 dinitrotoluene, 1-1.5 trinitrotoluene, 0.05-0.1 parathion, 1 iodine, 0.001-0.002 beryllium and its compounds, 4-5 molybdenum compounds, 0.5 vanadium pentoxide as dust, 0.1 V2O5 as fume, 1 ferrovanadium, 5 zinc oxide fumes, 5 zirconium and its compounds, 1 chlorinated derivatives of diphenyl, and 0.5 chlorinated derivatives of diphenyloxide.

1958

37542 **APTIC NO. 60344**

Assoc. Steam Boiler Owners, Essen (West Germany)

RESTRICTING DUST EMISSION FROM NATURAL-DRAFT STEAM GENERATORS, CAPACITY 25 TON/HR AND LESS, LIGNITE-FIRED WITH STATIONARY OR MECHANICAL GRATES. *(Staubauswurf Dampferzeuger ueber 10 t/h Leistung Braunkohlen-Rostfeuerungen Feststehende Roste oder mechanische Roste ohne Unterwind). VDI (Ver. Deut. Ingr.) Richtlinien), no. 2098:2-11, July 1958. 11 refs. Translated from German. Public Health Service, 22p., APTD-1583.*

The German specifications for the technological measures for the reduction of dust content, for the technical possibilities for dust precipitation, and for a suggestion for the restriction of dust emission are given. The standards concern the fuels, operating variables, flue gas content, dust concentration, and dust separators for lignite-fired furnaces with stationary or mechanical grates. Operating data are given for dust chamber collectors with and without baffles and for centrifugal separators with simple, high-efficiency, and plain cyclones. Conditions for best efficiency of collection in mechanical dust separators and for best dispersion of pollutants from stacks are described.

LEGAL AND ADMINISTRATIVE

1974

37543 **APTIC NO. 59339**

Chrosciel Stanislaw and Maciej Nowicki

A METHOD FOR THE OPTIMAL LOCATION OF URBAN AND INDUSTRIAL AGGLOMERATIONS. *Experientia Suppl., no 20: 169-179, 1974. 18 refs.*

A new method for the optimal location of urban and industrial agglomerations based on a pollution dose factor is proposed. The pollution dose factor allows the comparison of various pollutants in one and the same model and makes simple optimization procedures possible. Frequency of wind velocity in a sector, number of wind velocity ranges, and number of wind direction segments are also taken into account. Calculations on theoretical town model comparisons indicate that the best conditions exist in towns with linear character and proper orientation in relation to prevailing wind directions. The equivalence from the point of view of air pollution is shown for three analyzed concentric models with the commercial center in the middle and the urban and industrial districts surrounding it. The inappropriateness of the traditional settlement structure, circle or square shaped, with the industrial districts on its edges is confirmed by the fact that the mean pollution dose in this case is 75% higher than in the linear town.

37544 **APTIC NO. 59725**

Foley, Gary J., John O. Smith, and William R. Schofield

A SYSTEMS ANALYSIS FOR SOX CONTROL TECHNOLOGY RESEARCH AND DEVELOPMENT. *Preprint, 19p., 1974. (Presented at the Environmental Engineering and Science Conference, Annual Meeting, 4th, Louisville, Ky., March 4-5, 1974.)*

A summary of development work performed to date and planned for the future is presented for a systems analysis of sulfur oxide stationary source control technology. The system will include an emissions inventory for major sources of SOx and cost and performance models for control technologies. Those technology areas considered to date for inclusion into the system are: throwaway flue gas cleaning, regenerable flue gas cleaning, high-Btu gasification, chemical coal cleaning/coal liquefaction, low-Btu gasification with advanced power cycle, and modified combustion techniques. Forecasts will be used to project the growth of major SOx emission sources, to estimate the time of availability of certain control technologies, and to indicate the most promising areas for research and development. The system will be capable of determining the most applicable control technology for a particular source and selecting an optimum design which meets SOx standards while minimizing cost and other impacts. It will also evaluate the impact of potential future occurrences.

37545 **APTIC NO. 59969**

Hayashi, Hiroshi

PROBLEMS ON MEASUREMENTS OF AUTOMOBILE EXHAUST GAS EMISSION. *(Jidosha haikigasu sokuteijo no mondaiten). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(3):179-182, March 1974. 8 refs.*

A standardization program for the measurement of automotive emissions should establish standard driving modes, simulation of the driving modes, environmental conditions, gas sampling methods, and gas analysis methods. The standard driving modes should represent actual driving cycles of automobile traffic in a given area. The power absorption characteristics of the chassis dynamometer should faithfully reproduce the running resistance characteristics of an actual automobile for simulation. Environmental conditions should include effects of meteorological factors such as atmospheric pressure, temperature, and humidity. For the gas sampling, the constant volume sampling (CVS) method is discussed. The non-dispersive infrared analysis (NDIR) for carbon monoxide, the hydrogen flame ionization detector for hydrocarbons, and the chemiluminescence detector for oxides of nitrogen are recommended. A Japanese committee comprising four technical panels was established in 1972 to study the subject in order to set more rational standard measurement methods.

37546 **APTIC NO. 60215**

Kirk, Alan G., II

MINNESOTA AIR QUALITY PLAN. NOTICE OF PUBLIC HEARING. *Federal Register, 39(24):4503-4504, Feb. 4, 1974.*

Notice is given that pursuant to the provisions of section 110(f) (1), (2) of the Clean Air Act a public hearing will be held on March 26, 1974 for the purpose of determining whether the requirements of Regulation APC-5, designed to attain and maintain both primary and secondary national ambient air quality standards for particulate matter, of the State of Minnesota Implementation Plan to Achieve and Maintain Air Quality Standards, as said regulation applies to the Boise Cascade Corp. kraft pulp and paper mill in International Falls, Minnesota, should be postponed for a period not to exceed one year.

37547 **APTIC NO. 59574**

Lewis, T. H.

STATE AIR DATA INFORMATION SURVEY. (FINAL REPORT). *International Business Machines Corp., Gaithersburg, Md., Federal Systems Div., Office of Air and Water Programs Contract 68-02-1008, Program Element 2AE132, EPA-450/3-74-001, 130p., Jan. 1974.*

A State Air Data Information Survey was conducted to identify and investigate possible problems at the state level that are associated with emission inventories and air quality data systems. Problems arising during normal daily activities and related to the Federal requirements for quarterly and semi-annual reports of air quality and emission data are described. The survey covers the techniques used to store, access, and maintain emission inventory and air quality files; significant problems associated with maintaining and using such files; and anticipated problems in meeting the proposed Federal regulations for the State quarterly and semi-annual reporting requirements, especially as related to providing data in standard EPA formats. A sample survey questionnaire is given, and survey results are compiled.

37548 **APTIC NO. 59294**

McCabe, J. M.

ENVIRONMENTAL IMPACT STATEMENTS ON FEDERAL AGENCY ACTIONS. AVAILABILITY OF EPA COMMENTS. *Federal Register, 39(40):7613- 7617, Feb. 27, 1974.*

Pursuant to the requirements of section 102(2) (C) of the National Environmental Policy Act of 1969 and section 309 of the Clean Air Act, as amended, the Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in the following appendices during the period of January 1, 1974 and January 31, 1974. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing and includes the Federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA s comments, and the EPA source for copies of the comments. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental impact statements. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing during the review period. Appendix-IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments.

37549 **APTIC NO. 59297**

McGarry, Michael G.

AIR POLLUTION CONTROL IN THE DEVELOPING COUNTRY. *Experientia Suppl., no. 20:115-122, 1974. 4 refs.*

Problems associated with air pollution control in the developing countries, especially Southeast Asia, are reviewed. The polluters are most often those components of an economy upon which national development relies, and government is faced with reaching a compromise between an improved environment and strength in the commercial and industrial sectors. Inadequate education of government personnel and lack of motivation in the common urbanite who remains in relative ignorance concerning the adverse effects of pollutants also strongly contribute to the problem. Research, monitoring, and enforcement programs suffer as a consequence of insufficient expertise in the field of air pollution control; and often there is a tendency to over-simplify the content of regulations and to import environmental quality standards from the industrialized states which do not reflect the physical and social conditions of the developing country.

37550 **APTIC NO. 60220**

Meyers, Sheldon

IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. AVAILABILITY OF COMMENTS. *Federal Register, 39(65):12157-12161, April 3, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in the following appendices during the period of February 1, 1974 to February 28, 1974. Appendix I contains a listing of draft environmental impact statements providing the Federal agency responsible for the statement, the number and title of the statement, the classification of the nature of EPA s comments as defined in Appendix II, and the EPA source for copies of the comments as set forth in Appendix V. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing; and Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions reviewed and commented upon in writing pursuant to section 309(a) of the Clean Air Act, as amended, during the referenced reviewing period.

37551 **APTIC NO. 59445**

Nevers, Noel de and Albert H. Wehe

AN AIR QUALITY APPROACH TO NATURAL GAS CURTAILMENT. *J. Air Pollution Control Assoc., 24(3):211-215, March 1974. 5 refs.*

A natural gas curtailment procedure designed to improve air quality is proposed and discussed. As a means for meeting sulfur oxide standards for ambient air quality, natural gas is unsurpassed. It is virtually sulfur-free, so that replacing any other fossil fuel with natural gas removes from the atmosphere all the sulfur oxides due to the displaced fuel. In addition, particulate emissions from gas firing are about one third those from 99% controlled coal firing. Properly designed gas-fired burners produce lower nitrogen oxides emissions than comparable oil and coal-fired burners. Computer simulations of an air quality approach, in comparison with an approach which ignores environmental factors, shows that the air quality approach will produce significant improvements in air quality over the non-environmental approach. (Author abstract modified)

37552 **APTIC NO. 59398**

Patel, Nitin R.

A MARKOV PROCESS MODEL FOR DYNAMIC CONTROL OF EMISSIONS. *Experientia Suppl., no. 20:159-167, 1974. 3 refs.*

A simple model for dynamic air pollution control based on the box model for diffusion is examined in an effort to illustrate the merits of dynamic emission standards which set down different emission levels for different meteorological conditions. A dynamic emission policy that meets air quality standards at the lowest cost is obtained along with a comparison of its average cost per day versus that of a static policy; a ratio of 7:12 is calculated for the dynamic to static cost estimate. The dynamic model is then expanded in order to incorporate ventilation states other than total and zero ventilation, have air quality standards specified by both a constraint of type and an average annual concentration constraint, and have more than two levels of emission standards. Parametric runs on the model are made to illustrate the cost effects of tightening or relaxing air quality standards. The dynamic strategy is seen as rendering feasible techniques and apparatus for pollution control which have high operating costs.

37553 **APTIC NO. 59578**

Pooler, Francis, Jr.

NETWORK REQUIREMENTS FOR THE ST. LOUIS REGIONAL AIR POLLUTION STUDY. *J. Air Pollution Control Assoc., 24(3):228-231, March 1974. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 1973, Paper 73-160.)*

Criteria determining siting requirements for a monitoring network are briefly reviewed, together with the modelling and other objectives of the Regional Air Pollution Study. The schematic layout of sites proposed for St. Louis is described and discussed in terms of the conflicting requirements of extended regional coverage vs. close spacing of sites to achieve desired spatial resolution. More detailed criteria for selection of specific sampling locations within the general network layout are described. These depend on both physical features in the immediate vicinity of proposed locations, and on the locations of both near and distant sources. There were 25 sites selected which will measure carbon monoxide, hydrocarbons, nitrogen oxides, sulfur dioxide, free particulates, and such meteorological parameters as wind, temperature, moisture, turbulence, and solar and sky radiations. (Author abstract modified)

37554 **APTIC NO. 59577**

Prud homme, Robert K.

AUTOMOBILE EMISSIONS ABATEMENT AND FUELS POLICY. *Am. Scientist, 62(2):191-199, March-April 1974. 21 refs.*

The areas of conflict between the 1970 Clean Air Amendments which prescribe automobile emission standards for 1975-1976 and national fuels policy are discussed. They include fuel lead content requirements, refinery capital investments, gasoline price increases, and foreign oil imports. The currently used catalytic converter control device requires the use of high octane fuel. Achieving this with lead-free gas causes a 12% drop in average miles per gallon of gasoline. Any system involving catalysts in the fuel processing requires large investments in capital and increased consumption from 5-25%. The best alternative to the internal combustion engine appears to be the stratified charge engine because it uses the same basic engine block as the present engine. It offers better gasoline economy if only the reduction of hydrocarbons and carbon monoxide emissions are required. Neither this engine nor the Wankel engine can meet the 1976 standards, especially the nitrogen oxides standard in full sized cars. The NOx standards are being reviewed. Among the reasons is the fact that air in cities is approximately three times lower in NOx content than had been assumed. It may be justifiable to raise the standards by some small amount to allow for alternate technology.

37555 **APTIC NO. 59315**

Quarles, John

STATE AND LOCAL ASSISTANCE. SUBPART B--PROGRAM GRANTS. *Federal Register, 39(41):7785-7789, Feb. 28, 1974.*

Interim regulations are hereby promulgated to amend certain portions of the Environmental Protection Agency State and local assistance grant regulations (40 CFR Part 35) which pertain to air and water program grants. The amendments delete the air pollution control interstate planning grant regulations from the air pollution control program grant regulations. Major revisions to the air pollution control program grant regulations are: the regulations are now structured similar to the water program grant regulations under section 106 of the Federal Water Pollution Control Act Amendments of 1972, including output orientation; the premaintenance and maintenance concept has been eliminated; the regulations now provide for issuance of annual national air strategy guidance to the regions and States; agency programs are to be based on the State implementation plan and EPA annual guidance and are to be evaluated on achievement and effectiveness in meeting the objectives and outputs programed; and the regulations provide flexibility to the Regional Administrators for reducing grant amounts when a grantee fails to achieve outputs programed. The interim program grant regulations become effective February 25, 1974.

37556 **APTIC NO. 59627**

Quarles, John

APPROVAL AND PROMULGATION OF COMPLIANCE SCHEDULES. *Federal Register, 39(47):9176-9177, March 8, 1974.*

To avoid confusion and/or possible litigation as to the applicability of the Federal compliance schedule for Michigan, the regulation is clarified to specify that compliance is required with the approved emission limitations specified in the Michigan Air Pollution Control Commission Rule 336.49. The changed language is not intended to deny a source subject to the Michigan Rule the opportunity of obtaining an exemption from the State pursuant to the provisions of the Rule. If such an exemption is obtained from the State it will not be given any Federal force or effect unless first approved by the Environmental Protection Agency as a plan revision.

37557 **APTIC NO. 59641**

Quarles, John

SULFUR DIOXIDE EMISSIONS IN ARIZONA AND NEW MEXICO. *Federal Register, 39(56):10582-10585, March 21, 1974.*

The Environmental Protection Agency approved with specific exceptions, plans for implementation of the national ambient air quality standards submitted by Arizona and New Mexico. Regulations were proposed to correct deficiencies of the plans, and the power plants affected presented data to change the final compliance date and the sulfur dioxide emission limitation. After review of the data and public hearings, the regulations were changed. The dates for attainment of the national primary sulfur oxides standard have been extended, and the control strategy and regulations for SOx have been changed.

37558 **APTIC NO. 59659**

Quarles, John

APPROVAL OF PLAN REVISIONS: NEW YORK. *Federal Register, 39(50):9665-9669, March 13, 1974.*

Approval has been given to a proposed revision of the New York State implementation plan which modifies the control strategy for sulfur oxides in the New York-New Jersey-Connecticut Air Quality Control Region by granting the Orange and Rockland Utilities, Inc., a temporary exception to the fuel standard of the New York State Official Compilation of Codes, Rules, and Regulations. The reason for this exception is the insufficient supply of low-sulfur fuel. It is temporary in nature and will not prevent the achievement and maintenance of national ambient air quality standards for sulfur oxides and particulates in the New York area by 1975. The reasons for the approval and potential impacts are discussed.

37559 **APTIC NO. 60044**

Quarles, John

REVISION TO THE NEW YORK STATE IMPLEMENTATION PLAN. NOTICE OF PROPOSED RULEMAKING. *Federal Register, 39(24):4485-4486, Feb. 4, 1974.*

Notice is issued to advise the public that comments may be submitted on whether proposed revisions to the New York State Implementation Plan should be approved or disapproved as required by section 110 of the Clean Air Act. Supplemental information to the New York State plan consists of testimony presented at the Environmental Protection Agency public hearings on proposed regulations to correct deficiencies in the State s plan; amended Part 226 of Subchapter A, Chapter III, Title 6 of New York s Official Compilation of Codes, Rules, and Regulations; and 1971-1972 air quality data for sulfur dioxide in the Hudson Valley Intrastate Region which were submitted on October 26, 1972, February 6, and March 7, 1973. Revised Part 226 sets forth a maximum allowable sulfur limitation of 1.1 lb/million Btu gross heat content for fuel oil and 1.8 lb/million Btu gross heat content for coal; these limitations are more stringent than the prior ones in Part 226.

37560 **APTIC NO. 60046**

Quarles, John

THE 1976 NITROGEN OXIDE EMISSION STANDARD. APPLICATIONS FOR SUSPENSION. *Federal Register, 39(23):4132, Feb. 1, 1974.*

Effective January 25, 1974, applications for suspension of the 1976 nitrogen oxide emission standard for light duty vehicles have been approved by the Environmental Protection Agency Administrator for the following applicants: American Motors Corp.; Baverische Motoren Werke AG (BMW); British Leyland Motor Corp.; S. A. Automobiles Citroen; Daimler-Benz AG; Ferrari S.p.A. SEFAC; Fiat S.p.A.; Fuju Heavy Industries, Ltd.; Jensen Motors, Ltd.; Lancia S.p.A.; Officine Alfieri Maserati S.p.A.; Nissan Motor Co., Ltd.; Regie Nationale Des Usine Renault; Rolls Royce, Ltd.; Vokswagenwerk A.G.; and A.B. Volvo. Each applicant s 1976 model year light duty vehicles sold in the United States will be required to meet the interim NOx standard of 2.0 g/mi.

37561 **APTIC NO. 59296**

Sand, Peter H.

37562 **APTIC NO. 60132**

Schene, Horst

INTEGRATED WORK GROUP IN COMPANIES TAKES CARE OF ENVIRONMENTAL PROTECTION. SUITABLE FOR LARGE AND SMALL ENTERPRISES. *(Innerbetrieblicher Arbeitskreis als Leitstelle fuer Umweltschutz). Text in German. Umwelt (Duesseldorf), 4(1):32-35, 1974.*

Experiences with a work group for environmental protection in the facilities belonging to Daimler Benz AG are described. The work group has coordinating and controlling functions. It takes care of all prerequisites for fulfilling the legal requirements. This includes instructions concerning collection, storage, and transport of special waste products, old oil, and lacquer remains. The emissions are monitored with Dreager tubes. Data concerning waste air volumes are collected. Type and quantities of emissions are obtained by studying the individual process steps. For instance, in the case of a lacquer drying furnace, the quantity of evaporated solvents is estimated from the amount of processed lacquer. If a new process is introduced or new chemicals are used, the effect on the emissions is determined. If the emissions increase too much, protective measures are studied. In many cases, less polluting processes will be sought. For instance, for lacquering, dry pulverized lacquer can be electrostatically applied. The pulverized lacquer contains no solvents which could be emitted into the atmosphere. The emissions from the melting process are removed thermally from the waste gas.

37563 **APTIC NO. 59280**

Strelow, Roger

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. FEDERAL CERTIFICATION TEST RESULTS FROM 1974 MODEL YEAR. *Federal Register, 39(40):7664-7705, Feb. 27, 1974.*

Emission levels for hydrocarbons, carbon monoxide, and oxides of nitrogen are listed for vehicles and engines representing all of the models and configurations certified as of December 31, 1973 for the 1974 model year. Emission and fuel economy data were obtained from the original emission data vehicles and engines and were adjusted by appropriate deterioration factors. All of the vehicles and engines listed conform to Federal emission standards for the 1974 model year.

37564 **APTIC NO. 59311**

Strelow, Roger

GUIDELINES FOR DESIGNATION OF AIR QUALITY MAINTENANCE AREAS. *Federal Register, 39(38):7196-7197, Feb. 25, 1974.*

Copies of the Environmental Protection Agency s Guidelines for Designation of Air Quality Maintenance Areas are now available for inspection in State Air Polluton Control Offices, EPA Regional Offices, and the Freedom of Information Center, EPA, 401 M Street, SW Washington, D. C. The guidelines are to assist State agencies in identifying areas which they propose, after public hearings, to designate as Air Quality Maintenance Areas. These areas are identified as having the potential of exceeding air quality standards between 1975 and 1985.

37565 **APTIC NO. 59624**

Train, Russell E.

NORTH CAROLINA STATE IMPLEMENTATION PLAN. PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(55):10438-10448, March 20, 1974.*

Compliance schedules are presented which will be approved by the Environmental Protection Agency as part of the North Carolina State Implementation Plan. The schedules establish dates by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. Complete compliance schedules are available from the EPA. Interested parties are encouraged to comment on the proposed compliance schedules.

37566 **APTIC NO. 59650**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVIEW OF INDIRECT SOURCES. *Federal Register, 39(38):7270-7285, Feb. 25, 1974.*

All state implementation plans were disapproved on March 8, 1973 by the Environmental Protection Agency Administrator because of their failure to sufficiently assess and provide for maintenance of standards and specifically for their failure to provide for an indirect source review. The Agency has to date received 14 officially submitted state plans for review of indirect sources. Five (Connecticut, Kentucky, New Hampshire, Vermont, and Virginia) have been or will shortly be proposed for public comment on their approvability and remain disapproved until the Administrator completes his evaluation. Seven of the state plans (Alabama, Idaho, Maine, New York, North Carolina, Oregon, and Washington) contain deficiencies which are specifically identified in this announcement. Only the Florida and Guam indirect source review procedures can be fully approved at this time. The Administrator strongly urges States to utilize the time allowed by the deferred effective data to develop and submit their own indirect source review procedures. The effective date of the regulations will be July 1, 1974, and they will be applicable to indirect sources commencing construction on or after January 1, 1975. A listing is provided of States for which plans have been disapproved with respect to maintenance.

37567 **APTIC NO. 59657**

Train, Russell E.

AIR PROGRAMS; STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. ADDITIONS AND MISCELLANEOUS AMENDMENTS. *Federal Register, 39(47):9307-9323, March 8, 1974. 2 refs.*

Changes, additions, and amendments are given to the standards of performance for new and modified stationary sources within seven categories: asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The promulgated standards for asphalt plants are 90 mg/dscm particulates and 20% opacity. The standards for petroleum refineries are: the combustion of process upset gases in flare systems has been exempted; hydrogen sulfide in flue gases may be monitored at one location; the opacity standard for catalyst regenerators is now less than 30% in any 1 hr except for 3 min in any hour; and the standard for particulate matter is 1.0 kg/1000 kg of coke burn-off in the catalyst regenerator. A vapor recovery system or equivalent control is required in petroleum storage vessels with capacities greater than 151,412 l if vapor pressure is greater than 570 mm mercury, and a floating roof or equivalent control is needed if pressure is between 78 and 570 mm Hg. Brass and bronze plant standards are 50 mg/dscm particulates and 20% opacity, 10% opacity, and 10% opacity, for reverberatory furnaces having production capacities equal to or greater than 1000 kg, for electric furnaces having capacities equal to or greater than 1000 kg, and for blast (cupola) furnaces having greater than or equal to 250 kg/hr capacities, respectively. Iron and steel plant basic oxygen furnaces are limited to no more than 50 mg/dscm particulates. Sewage sludge incinerators are limited to no more than 0.65 g/kg dry sludge input and 20% opacity. The opacity standard, test methods, definitions, standards of performance, and applicability and designation of affected facilities are described.

37568 **APTIC NO. 59658**

Train, Russell E.

AUTOMOTIVE SULFATE EMISSIONS. REQUEST FOR SUBMISSION OF DATA. *Federal Register, 39(47):9229-9231, March 8, 1974.*

Notice is given that the Environmental Protection Agency seeks submission of data and views regarding the magnitude of automotive sulfate emissions, the impact of such emissions on ambient air quality, and the feasibility of alternative approaches to controlling such emissions. A majority of 1975 and later model automobiles are expected to be equipped with oxidation catalyst emission control systems to achieve emission standards for hydrocarbons and carbon monoxide. However, these systems may increase sulfate emissions. Therefore, information is being sought on measurement methods, magnitude of sulfate emissions, control of these emissions through vehicle modifications and fuel modifications, and the impact of sulfate emissions.

37569 **APTIC NO. 59660**

Train, Russell E.

REQUIREMENTS FOR PREPARATION, ADOPTION, AND SUBMITTAL OF IMPLEMENTATION PLANS. SIGNIFICANT HARM AND EMERGENCY ACTION LEVELS FOR PHOTOCHEMICAL OXIDANTS (SMOG). *Federal Register, 39(50):9672-9675, March 13, 1974. 10 refs.*

This notice of proposed rulemaking proposes a revision to both the significant harm level for photchemical oxidants (smog) and the emergency action level for that pollutant. The proposed standard is a single concentration of 1200 micrograms/cu m (0.60 ppm), 1-hour average, rather than three different concentrations for 1-hour, 2-hour, and 4-hour averages. This level is based on studies on the effect of ozone on subjects lightly exercising. State implementation plans are required to establish alert, warning, and emergency levels of air pollutant concentrations. The emergency level for oxidants should be 1000 micrograms/cu m (0.50 ppm), 1-hour average. The kinds of action which may have to be taken at the emergency level are listed, including a shutdown of operations at many or most offices, business, and industries, and prohibition on the use of motor vehicles except in emergencies. Literature on the effects of ozone and other oxidants is reviewed.

37570 **APTIC NO. 59351**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISIONS TO WASHINGTON IMPLEMENTATION PLAN. *Federal Register, 39(39):7433, Feb. 26, 1974.*

Submitted revisions to the Washington Administrative Code, chapters 18-40 (Suspended Particulates), 18-12 (Open Burning), and 18-04 (General) plus a new chapter, 18-06 (Sensitive Areas) have been reviewed by the Environmental Protection Agency administrator and are consistent with the approved implementation plan. The amended chapter 18-04 provides for adoption of a generalized compliance schedule for all sources subject to future effective standards in the regulation, and the new chapter 18-06 sets more stringent requirements than those contained in the general regulation for wigwam burners in designated sensitive areas.

1973

37571 **APTIC NO. 59517**

Boland, John J.

A FRAMEWORK FOR EVALUATING POWER PLANT SITING DECISIONS IN THE CHESAPEAKE BAY REGION. *John Hopkins Univ., Baltimore, Md., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Order No. 73-28,383, 1973, 237p., 56 refs.*

Social, economic, and environmental issues surrounding the siting of power plants are described. Economic models are investigated as a means of placing all related factors into a common framework for evaluation. Particular attention is given to approaches which would be appropriate to decisions involving the use of the Chesapeake Bay as a source of power plant sites. It is assumed that society wishes to maximize the total return from the use of all environmental resource services, with proper consideration given to future values. This objective is used as a basis for an asset utilization type model. Constraints are defined which describe all linkages between environmental resource services, and the nature and characteristics of the various economic activities which utilize those services. The resulting model, termed the Environmental Resource Management Model, relies on the use of a single parameter to rank alternate proposals on the basis of their impact on all users, present and future of the resource services. The ranking parameter is an estimate of the total revenue society would derive if it were able to price each resource service at a level sufficient to make it indifferent between the last increments of use. (Author abstract modified)

37572 **APTIC NO. 59281**

Broadbent, D. H.

ENVIRONMENTAL ISSUES IN THE MANAGEMENT OF A PUBLIC INDUSTRY. *Atmos. Environ., 7(12):1199-1204, 1973.*

Future energy supplies and the environment of the United Kingdom are discussed. It is assumed that more energy per capita will be needed, but exponential growth of demand seems likely to be arrested by more efficient use. New technologies and developments which will effect the energy scene in the U. K. include: thermal efficiency of power stations, using refuse and waste, recycling metals, transport, utilization of energy, and primary fuel consumption.

37573 **APTIC NO. 59276**

Cocude, M.

REGULATIONS CONCERNING STATIONARY COMBUSTION EQUIPMENT WITH RESPECT TO AIR POLLUTION. *(La reglementation des installations fixes de combustion au titre de la pollution atmospherique). Text in French. Rev. Gen. Thermique (Paris), 12(142):1055-1058, Oct. 1973. 11 refs.*

Regulations imposed on industrial and domestic combustion equipment to abate pollutant emissions are surveyed. Minimum stack height and minimum rate of discharge (2 m/sec) are prescribed for solid and liquid fuel-firing equipment with capacities exceeding 1000 thermal units/h. To maintain the annual average sulfur dioxide concentration at or below a limit value of 0.250 mg/cu m, the specific sulfur emission is limited to 2 g/thermal unit. Fuel oil No. 1 and fuel Oil No. 2 are permitted in protection zones for use in combustion equipment with capacities of less than 500 and 1000 thermal units/h, respectively. The combustion of wastes, turf, and lignite is prohibited in protection zones. Proper heat insulation is regarded as one of the essential means of pollution abatement.

37574 **APTIC NO. 59575**

Devitt, Timothy W., Richard W. Gerstle, and Norman J. Kulujian

FIELD SURVEILLANCE AND ENFORCEMENT GUIDE: COMBUSTION AND INCINERATION SOURCES (FINAL REPORT). *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Environmental Protection Agency Contract 68-02-0606, APTD-1449, 255p., June 1973. 44 refs.*

Guidelines for state and local air pollution control agencies in their field surveillance and enforcement activities concerning combustion and incineration emission sources were developed. The combustion and incineration processes, atmospheric emissions from these processes, and emission control methods are described. The basic types of emission control devices are mechanical collectors, wet scrubbers, electrostatic precipitators, fabric filters, and afterburners. All of these have been used to some extent to control emissions from incinerators and fuel-fired combustion processes. Environmental Protection Agency control techniques documents for particulate, sulfur oxides, and nitrogen oxides are included. General guidelines on emission source inspection of steam electric plants, municipal incinerators, and common types of commercial/industrial incinerators. The types of records that should be kept to facilitate inspections are identified. (Author abstract modified)

37575 **APTIC NO. 59870**

Duerre, W.

REGULATIONS FOR THE CONSERVATION OF CLEAN AIR AND HOW THEY ARE HANDLED. *(Zu Vorschriften der Luftreinhaltung und deren Handhabung). Text in German. Umwelt (Duesseldorf), no. 4: 21-28, 1973. (Presented at the Congress Umwelt 72, Stuttgart, June 30 to July 9, 1972.)*

European regulations concerning the emission of air pollutants are welcome as long as the demands are not below the present state-of-the-art. Unfortunately, presently many progressive rules effective in the more developed countries were lifted in favor of less efficient European regulations. The U. S. have set a good example by demanding that the limits of 1970 for carbon monoxide, hydrocarbons, and oxides of nitrogen to one tenth by 1976. Despite the loud protests by the car manufacturers at first, two have already indicated that they can comply with the regulations. In the Federal Republic of Germany, scientists and representatives of the industry have worked together with the Federal Ministry of the Interior of the foundations of an extensive emission protection law. The law is now in parliament.

37576 **APTIC NO. 59266**

Easterling, Mahlon

PERIODIC MOTOR VEHICLE INSPECTION AS A SMOG ABATEMENT MEASURE IN THE SOUTH COAST AIR BASIN. *California Inst. of Tech., Environmental Quality Lab., Memo 2, National Science Foundation Grant GI-29726, 30p., Jan. 1973. 5 refs.*

Measurements are outlined for periodic motor vehicle inspection as a smog abatement procedure for the California south coast air basin. Desirable features of a mandatory inspection and maintenance system outlined include: performance of the inspection by the state (or a state supervised not-for-profit organization), performance of maintenance by whomever the owner of the vehicle chooses, the establishment of a vehicle registration dependent on inspection passage, arrangement of an inspection procedure which allows for any vehicle in reasonably good operating condition to pass and which provides diagnostic information to aid in the repair, initiation with a pilot program in Los Angeles devoted to light duty vehicles, the combination of safety-inspection programs with emission inspections, and the inclusion of vehicles using fuels other than gasoline into the system.

37577 **APTIC NO. 59878**

Epstein, Edward S.

NATIONAL AND INTERNATIONAL PROGRAMS FOR MONITORING THE GLOBAL ENVIRONMENT. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York; American Meteorological Society, Boston, Mass.; Dept. of Transportation, Washington, D. C.; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronic Engineers, New York; Instrument Society of America, Pittsburgh, Pa., National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Rockville, Md., Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 5-8. (Dec. 10-12, Paper ISA JSP 6652.)*

Major national and international programs in global environmental monitoring are described which provide for necessary coordination of environmental observations, for processing and management of data and information, and for the preparation of warnings, prediction, and assessments of environmental conditions.

37578 **APTIC NO. 60120**

Gibson, J.

THE COAL RESEARCH ESTABLISHMENT. *(Die Kohlenforschungzanstalt). Text in German. Glueckauf (Essen), 109(1):66-71, Jan. 1973. 11 refs.*

The activity of the British Coal Research Establishment, devoted to the problems of the processing and use of coal, is described. Domestic heating units with smoke consumer for the high-efficiency combustion of coals with high volatile matter content have been developed. Prototypes of domestic heating appliances are tested according to a Domestic Solid Fuel Appliance Approval Scheme. New fluidized-bed coal-fired boilers with steam pipes led through the combustion zone operate at relatively low temperature, and facilitate the retention of the coal sulfur content in the ashes by the addition of adequate materials, e.g., of limestone or dolomite.

37579 **APTIC NO. 59979**

Hayasaki, Jun

PRESENT STATUS OF THE CONTROL OF SOLVENTS IN THE U.S.A. --- THE STRENGTHENING CONTROL OF SOLVENTS IN THE U.S. ACTIVATED BY LOS ANGELES RULE 66. *(America no yozai kisei no genjo --- Los Angeles Rule 66 no chushin ni kakudai suru America no yozai kisei). Text in Japanese. Kagaku Keizai (Chem. Ind. Econ.), 22(12):22-33, Nov. 1973. 12 refs.*

Air pollution control legislation for New York City, Indiana, Ohio, Philadelphia, and especially Los Angeles is reviewed. Solvent regulations call for the use of 20% aromatics, 55-60% aliphatics, and 20-25% esters and alcohols to replace xylene. Xylene, toluene, and mineral spirits are being replaced by low carbon aromatics. Tokyo Bay Area pollution is compared to that of Los Angeles County.

37580 **APTIC NO. 60119**

Jenkinson, D. E.

THE DEPARTMENT FOR COAL PREPARATION. *(Die Hauptabteilung fuer Kohlenaufbereitung). Text in German. Glueckauf (Essen), 109(1):62-66, Jan. 1973.*

The research activity of the Department for Coal Preparation of the British Mining Research and Development Establishment is described. Different types of coals are washed and mixed with each other to supply coal with an ash content of 15-20% for thermal power plants, the largest consumers of coal in Great Britain. The power plants use coal in the below-25 mm fraction.

37581 **APTIC NO. 59350**

Quarles, John

KANSAS IMPLEMENTATION PLAN. APPROVAL OF PUBLIC HEARING PROCEDURES. *Federal Register, 38(239):34361, Dec. 13, 1973.*

The Environmental Protection Agency administration has determined that the Kansas procedures for notice of public hearings in regard to implementation plans, although different from the requirements of 40 CFR 51.4(b), provide for adequate notice to and participation by the public as consistent with Section 110 of the Clean Air Act. The Kansas procedures are thus approved upon the condition that notice under such procedures shall be not less than 25 days prior to the date of any hearing and that the record of any such hearing shall be kept open for public comment for at least 30 days from the date of the notice.

37582 **APTIC NO. 60316**

Wrist, P.

ENVIRONMENTAL LEGISLATION IN THE UNITED STATES AND ITS IMPACT ON THE PAPER INDUSTRY. *European Liaison Committee for Cellulose and Paper, Proc. EUCEPA Conf., 15th, Harmonizing Pulp Paper Ind. Environ., Rome, 1973, p. 87-101, 109-112. (May 7-11.)*

Environmental legislation in the United States and its impact on the paper industry is summarized. Until 1970 pollution regulations were primarily the responsibility of state and local governments and were based on achieving selected levels of ambient environmental quality. The different levels reflected the degree of industrialization and other local conditions. The first significant change was the National Environmental Protection Act of 1969 which required governmental agencies to evaluate the environmental impact of their actions and established a National Council of Environmental Quality. The Clean Air Act of 1970 established uniform national ambient quality standards, and a requirement for new facilities to use the best control technology available. The way in which these acts are being interpreted for the Paper Industry is analyzed, together with a survey of capital expenditures which have been made by the industry to control pollution. A review is made of current legislative activity covering recycling raw materials, land use practices, and pollution taxes, as well as their probable effect on the Paper Industry. Present legislation will increase manufacturing costs significantly; and, if the levels of control vary greatly between different paper producing countries, the resulting cost differentials could influence the location and future growth rate of the industry internationally. (Author summary modified)

37583 **APTIC NO. 59723**

Zimmer, Charles, Eugene Forte, and Robert Braley

GUIDELINES FOR THE DEVELOPMENT OF AN AIR QUALITY DATA SYSTEM. (FINAL REPORT). *Pedco-Environmental, Cincinnati, Ohio, Office of Air and Water Programs Contract 68-02-0044, EPA-450/3-73-008, 76p., Sept. 1973.*

Information obtained during the setting up of the Cincinnati Aerometric Data Handling System is provided to serve as a guideline for the design of aerometric data storage and retrieval systems. Data acquisition requirements, personnel requirements, manual and automated data handling procedures, design input data formats, output data formats, file types and media, and steps necessary to computerize the system are described.

37584 **APTIC NO. 59285**

Japan Chamber of Commerce, Tokyo, Bureau of Industrial Pollution Information

REPORT ON ACTIVITIES OF BUREAU OF INDUSTRIAL POLLUTION INFORMATION, OCTOBER 1973. *(Sangyo Kogai Sodanshitsu jigyo hokokusho). Text in Japanese. 33p. Oct. 1973.*

The activities of various branches of the Japan Chamber of Commerce, Bureau of Industrial Pollution Information for October 1973 included 110 cases on air pollution and 20 cases on odor; these numbers represented 14.1% and 2.8% respectively of all types of consultations. Of the 110 cases, 52 were on technical matters, 29 on legal matters, six on finances, 16 on control equipment, and seven on others. Consultations on technical matters included the selection of boiler flue gas dust collection and desulfurization systems, methods for treatment of hydrocarbons emitted by printing plants, and selection of stack gas control either by a high stack or a flue gas desulfurization system. Advice on the designing and installation of adsorption tower for odors emitted by the dryer for the paint coating of switchboards was given. Controls for odors emitted by the incineration of automotive parts repair paint and oil varnish are discussed. Stack gas collection hoods, jet scrubbing, and filters with activated carbon were recommended; when this was unsatisfactory, the use of neutralizer was suggested.

37585 **APTIC NO. 59638**

HEALTH LAWS AND REGULATIONS; FRANCE. *Intern. Digest Health Legislation, 24(4):784, 1973.*

The decree of Feb. 23, 1973 in France concerned the interministerial co-ordination in the sphere of air pollution control.

37586 **APTIC NO. 59639**

HEALTH LAWS AND REGULATIONS: AUSTRALIA. *Intern. Digest Health Legislation, 24(4):725, 727, 1973.*

The Australian Clean Air Act was amended on Sept. 13, 1971 to require a permit prior to sandblasting operations. On Nov. 19, 1971, the Clean Air Act was carried out with the formation of regulations applicable to the control of cement dust.

37587 **APTIC NO. 59654**

HEALTH LAWS AND REGULATIONS: JAPAN. *Intern. Digest Health Legislation, 24(4):865-869, 1973.*

Various Japanese laws for the control of air pollution are described. Law No. 97 of June 10, 1968 defines soot and smoke and regulates their emissions from industrial plants and business establishments and their emissions from vehicles. The level of air pollution is to be monitored; if it reaches serious levels, industrial and vehicular activity can be restricted. An ordinance for the enforcement of the Air Pollution Control Law specifies levels of pollutants which cause damage to health or the environment. Regulations for the enforcement of the Air Pollution Control Law establish standards for sulfur oxides, soot, dust, and noxious substances. An order specifies the limits of air pollution by motor vehicle exhausts.

37588 **APTIC NO. 59655**

HEALTH LAWS AND REGULATIONS: RHODESIA. *Intern. Digest Health Legislation, 24(4):915-916, 1973.*

An act to provide for the prevention and control of pollution in the atmosphere and to set up an Air Pollution Advisory Board and an Air Pollution Appeal Board has been passed in Rhodesia.

37589 **APTIC NO. 59656**

HEALTH LAWS AND REGULATIONS: DENMARK. *Intern. Digest Health Legislation, 24(4):748, 1973.*

Order No. 421 of Sept. 6, 1972 in Denmark restricted the sulfur content of heating oils at 0.8 and 2.5% in gas and fuel oils, respectively. The level is 1% in the case of fuel oil used in the areas of jurisdiction of the local authorities of Copenhagen and Frederiksberg and of the county authority of Copenhagen.

37590 **APTIC NO. 59722**

Engineering-Science, Inc., McLean, Va.

FIELD SURVEILLANCE AND ENFORCEMENT GUIDE FOR PRIMARY METALLURGICAL INDUSTRIES. (FINAL REPORT). *Office of Air Quality Planning and Standards Contract 68-02-0627, Program Element 2A5137, Rept. EPA-450/3-73-002, 379p., Dec. 1973. 49 refs.*

A step-wise enforcement procedure intended for use by state and local air pollution control agencies is presented in manual form. Included are process descriptions, a discussion of emission sources, typical control devices, stack gas and process monitoring instrumentation, and inspectors worksheets for such primary metallurgical operations as the iron and steel, aluminum, copper, lead, and zinc industries. All major operations in each of these are analyzed, including an enforcement procedure for the storage and handling of raw materials. Upset conditions and abnormal operating circumstances are examined in relation to their role in air pollution. Examination of the major pollutants from these five industrial categories provides the most concern for particulates. Sulfur oxides and fluorides are also of concern in specific metals operations. Sections on the inspection of pertinent air pollution control devices are also provided. (Author abstract modified)

37591 **APTIC NO. 59743**

TRW, McLean, Va., Transportation and Environmental Operations

OREGON EMISSION INVENTORY DATA CONVERSION. *Environmental Protection Agency Contract 68-02-1007, Task Order 2, Sales No. 96055.002, EPA-450/3-74-006, 53p., Nov. 1973.*

NTIS: PB 230930/AS

The methodology to develop and implement a computer program which could read the Oregon inventory emissions data files and convert the data to a format acceptable for input to the National Emissions Data System (NEDS) is described. The program in no way affects the Oregon data system, but merely reads the existing files and operates on what it reads. An attempt was made to write the program so that it would be a relatively easy task to incorporate any future additions to it, or to eliminate portions which lose their usefulness in later years. (Author summary modified)

37592 **APTIC NO. 59769**

PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio

QUALITY CONTROL PRACTICES IN PROCESSING AIR POLLUTION SAMPLES. *Office of Air Quality Planning and Standards Contract 68-02-0211, APTD-1132, 160p., March 1973. 29 refs.*

NTIS: PB 230890/AS

Guidelines for establishing quality control practices in processing air pollution samples are presented. A quality control program is developed to minimize sources of variation inherent in all analytical and technical functions. Through the use of standard operating procedures and statistical techniques, items such as determinate errors are identified and controlled. The major characteristics of quality control are described indicating the types of activities available for incorporation into a quality control program. Atmospheric monitoring, source monitoring, and laboratory operations are discussed in terms of control of physical parameters, analysis of the measurement process, and documentation and demonstration of quality control. The basic techniques of data handling and data evaluation are described particularly as they are applied in air pollution control laboratories.

37593 **APTIC NO. 59911**

PREVENTION OF CATASTROPHES. *(Katasptrophenverhuetung). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:374-376, Dec. 1973.*

The significance and functioning of air pollution monitoring and warning systems for the prevention of air pollution catastrophes is described generally. The probability of high pollutant concentrations prompting emergency situations is highest in areas with high average level of the air pollution, where adverse meteorological conditions are most likely to produce critical pollution situations. Therefore, pollution warning networks, connected to central computers, should be set up mainly in such areas. Such monitoring networks continuously measure especially sulfur dioxide concentrations. When an increase in the SO2 concentrations is registered, industries are required to limit their emissions according to a given schedule. If the concentrations increase further, the population is called on to stay at home. If the concentrations rise even further, traffic and industrial emissions are prohibited. The adverse level and emergency level of SO2 are set at 2.5 mg of SO2 per cu m and at 5 mg of SO2 per cu m in North-Rhine Westfalia.

37594 **APTIC NO. 59942**

EXISTING LEGAL REGULATIONS. *(Bestehende Rechtsgrundlagen). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:376-381, Dec. 1973.*

Existing Swiss legal regulations concerning industrial and domestic firing equipment, the design and operation of industrial facilities, and concerning automobile exhaust emissions are surveyed. Employers and manufacturers are required to employ all necessary and technically possible means for the protection of the lives and health of their employees as well as of the environment. Failure to comply with this regulation may prompt temporary shutdown of industrial facilities. Plans of would-be industrial facilities are examined and approved only if they meet labor safety and environmental protection standards. For automobiles, the existing legal regulations envisage positive crankcase ventilation and limitation of the idle carbon monoxide emission to 4.5%. Minimum engine power is prescribed to abate smoke emissions. Switzerland will adopt the uniform European regulations concerning automobile exhaust emissions and exhaust control devices.

1972

37595 **APTIC NO. 59919**

Boon, E. F., F. H. van Heel, P. Winkel, and P. Zonderland

A POLICY FOR THE REDUCTION OF INDUSTRIAL EMISSIONS. *Eur. Chem. News, 22(563):22, 24, 26, 28, Dec. 15, 1972.*

A policy for the reduction of industrial emissions in the Netherlands is presented based upon the following four principles: introduction of a legal structure for registering and controlling industrial wastes; registration or recording of industrial emissions by those responsible and monitoring of the figures by emission auditors; formulation of a policy defining the emissions allowable, both under current practice and with the future idea of emission reduction; and development of a research plan based on the studying of industrial emissions in terms of the sources, primary areas affected, and the consequences. The time schedule for emission reduction is proposed for structuring in terms of per emitter, per component, and per area with the aim of an overall emission reduction of 50% in 10 years.

37596 **APTIC NO. 59930**

McIntyre, D. P.

THE ENVIRONMENTAL CYCLE: A BASIS FOR ACTION. *Atmosphere, 10(1):10-17, 1972. 1 ref.*

An analysis is made of the channels by which the environment affects man and man affects the environment. The interactions between the natural environment (land, water, air, plants, and wildlife) and the manmade and social environment are studied. Conclusions are drawn as to how these interrelationships may be used to develop the information that man needs in order to ensure that the environment which results from this complex interplay is to his liking. The functions of reasearch and education in the decisions to be made by management and the function of management in environmental decisions are described. (Author abstract modified)

37597 **APTIC NO. 59571**

Sax, Joseph L.

LEGAL STRATEGIES APPLICABLE TO ENVIRONMENTAL QUALITY MANAGEMENT DECISIONS. *In: Environmental Quality Analysis. A. V. Kneese and B. T. Bower (eds.), Baltimore, Johns Hopkins Press, 1972, Chapt. 9, p. 333-343. 4 refs.*

The legal problems applicable to clean air and environmental quality management decisions are discussed. The main problem in environmental quality is effective implementation. Certain environmental resources such as clean air and water are priced low because the voices speaking in support of the values lack power and are muted. Enacting effluent charge laws will not necessarily make a substantial difference in results. Air has not been the subject of ownership like other properties. No private individual or group has been in a position to withhold access to the air. The ancient legal notion that the ambient air is the property of no one is detrimental to rational policy making. This can be overcome by defining resources like air as a commodity that is held in trust for the benefit of the entire community of citizens.

37598 **APTIC NO. 59516**

Selamoglu, Suha

ON THE SELECTION OF SITES OF AIR POLLUTION SAMPLING STATIONS. *North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society, Proc. Expert Panel Air Pollut. Modeling, 3rd Meet., Paris, France, 1972, p. XII-1-XII-6. 1 refs. (Oct. 2-3.)*

A mathematical model is presented for the selection of air pollution sampling station sites in a manner such that an optimum distribution may be obtained by way of comparisons among various geographical distributions of stations. The model accounts for the fact that different distributions will arise from different considerations pertaining to the use of the measurement data and the nature of the pollutants being examined. A weight function is presented which may be modulated at will, depending on the mode of use of the model-estimated data.

37599 **APTIC NO. 59615**

Ibaraki Prefecture (Japan), Environmental Pollution Research Center

ANNUAL REPORT OF THE ENVIRONMENTAL POLLUTION RESEARCH CENTER OF IBARAKI-KEN. *(Ibaraki-ken Koga i Gijutsu Senta Nenpo). Text in Japanese. No. 5, 204p. 1972.*

The annual report of the Environmental Pollution Research Center of Ibaraki Prefecture for 1972 includes the center's history, personnel, financial report, responsibilities, equipment, annual and special activities, and investigation and research projects. Both general activities, such as telemeter monitoring, and special investigations of specific areas, such as automotive exhaust gas in major cities and the effects of dusts on trees in the Kashima area, are given. In the Hitachi area, the frequency of sulfur oxide concentration exceeding 0.1 ppm hr was 36 times in 1972 and was only 1/4 of the previous year. The year's average was 0.024 ppm/hr. In the Kashima area, the frequency was 210 and doubled the number of the previous year; the year's average was 0.018 ppm. Both appeared between April and October, probably by the effect of sea breeze. Suspended particulate concentration in the Hitachi area was 0.02 mg/cu m and was about the same as 1971; in the Kashima area, the year's average was 0.03 mg/cu m, but relatively high concentrations were noted in winter, at 0.06 mg/cu m. Photochemical smog prediction (0.12 ppm oxidant) was issued most frequently for Mitsukaido and Furukawa (10 times) and a warning (0.15 ppm) was issued most frequently (9 times) in Mitsukaido. Flue gas dust investigations were given to 1800 emission sources in 1972. A high concentration of 1.12 g/N cu m was noted in asphalt plants, and 0.52-0.58 g/N cu m in woodwork processing industries. Cyanide emissions from various sources were also investigated, and propane automobile exhaust were found as sources of high CN concentration.

37600 **APTIC NO. 60342**

Research Corp. of New England, Hartford, Conn.

ENFORCEMENT MANAGEMENT SYSTEM. *Office of Air Programs Contract 68-02-0079, APTD-1237, TRC 42-088-00, 120p., Sept. 1972.*

The Enforcement Management System (EMS) was developed to aid air pollution control agencies in the handling of data arising from most agency enforcement activities. The EMS is capable of tracking, monitoring, scheduling, and reporting control agency actions with regard to pollution sources. The system emphasizes management control of enforcement functions and establishes standardized methods of handling data. The system was developed on three levels of sophistication to accommodate agencies of various sizes and capabilities. The lowest level does not require a computer; the two higher levels utilize computerized information processing techniques for handling enforcement data. Features of the system include: an action document which is reentered into the system upon completion of the action; management summary reports; automatic preparation of standarized letters or certificates to sources; reporting of overdue actions; and preparation of staff schedules. (Author abstract modified)

1971

37601 **APTIC NO. 59251**

Purdom, P. Walton

ENVIRONMENTAL PLANNING AND MANAGEMENT. In: Environmental Health, P. Walton Purdom (ed.), New York, Academic, 1971, Chapt. 12, p. 545-573. 44 refs.

An overall perspective is developed for the planning and management of the environment. Elements of program planning include: determination of needs; establishment of priorities; formulation of program objectives; examination of resources available and required; preparation of plan of action, including organization; preparation of budget; and formulation of a system for evaluation. An understanding of some fundamental principles of statistics is necessary to planning and management. Factors of particular interest include: vital statistics, statistical significance, and standard population. The organization of public efforts for environmental control is discussed and includes: data gathering, evaluation, and appraisal; advisory; direct; regulatory; educational; and research.

37602 **APTIC NO. 60322**

Teich, Albert H., Philip H. Howard, and LeeAnn Sumnicht

ENVIRONMENTAL RESEARCH LABORATORIES IN THE FEDERAL GOVERNMENT. AN INVENTORY. VOLUME II. *Syracuse Univ. Research Corp., Syracuse, N. Y., Policy Inst., National Science Foundation Grant GF-35, 509p., Sept. 1971.*

NTIS: PB 209752

An inventory of environmental research laboratories in the Federal Government has been assembled and includes the following information for each installation: the extent of environmental research, the type of installation, the mission or main function, number of personnel, budget data, geographical responsibility, description of the physical plant, unusual equipment or facilities, institutional ties, additional sites, publications and periodicals issued, meetings and symposia, training programs, future plans, and professional personnel data. Two appendices are also provided which outline the environmental role of the National Aeronautics and Space Administration and the reorganization of the Environmental Protection Agency.

37603 **APTIC NO. 59492**

New Hampshire Univ., Durham, Center for Industrial and Institutional Development

PLANNING A SOURCE TEST. *In: Air Pollut. Sampling Monit. Workshop, Durham, N. H., 1971, p. 7-9. (April 27.)*

When the sources or equipment have not previously been tested, a preliminary visit to the test site by source test personnel can save much time and effort. The best locations for gas flow measurements and sampling should be selected. Also to be considered during the plant inspection are accessibility, space requirements, availability of electricity, the operating schedule of the plant equipment, and estimates or preliminary measurements of temperatures, pressures, velocities, and moisture content of the gas streams to be tested. The test must be conducted under conditions representative of the desired operating characteristics of the equipment. Accurate results will depend upon selecting the correct sampling, analytical, and flow rate measurement techniques. When scheduling the actual test, the date selected must allow time following the plant inspection for provision of test facilities, for provision of personnel and equipment needed for tests of greater scope or complexity, or for development of special test methods. The date also must be coordinated with plant management personnel to ensure operation of the facilities under the conditions specified for the test.

37604 **APTIC NO. 59938**

North Atlantic Treaty Organization, Washington, D. C., Committee on Challenges of Modern Society

AIR POLLUTION. PRECIS FOR A PILOT PROJECT. *Preprint, 11p., 1971.*

Air pollution and its sources are reviewed generally including sulfur dioxide, particulate matter, carbon dioxide, carbon monoxide, hydrocarbons, and nitrogen oxides and automobiles, fuel combustion, and electricity generation. Trends are mentioned. National programs for air pollution control are centered under the National Air Pollution Control Administration. Various international organizations are concerned with air pollution including the Organization for Economic Cooperation and Development, The European Community, the Economic Commission for Europe, the Council of Europe, the World Health Organization, and the World Meteorological Organization. The U. S. has proposed a plan for meeting the air pollution problems confronting the member nations of the North Atlantic Treaty Organization. The objectives and methods of this plan are outlined. The U. S. would coordinate the program and provide manpower. The program would develop air quality criteria, project future air quality, use mathematical modeling to project air quality in major urban areas of participating countries, project needed control technology, and develop control technique documents representing current availability of control practices. Member country participation in the Committee on the Challenges of Modern Society study and goals of the study are reviewed.

1965

37605 **APTIC NO. 59501**

World Health Organization, Geneva (Switzerland), Expert Committee

ENVIRONMENTAL HEALTH ASPECTS OF METROPOLITAN PLANNING AND DEVELOPMENT. REPORT OF A WHO EXPERT COMMITTEE. *World Health Organization Tech. Rept. Ser., No. 297, 68p., 1965. 32 refs.*

Environmental health aspects of metropolitan planning and development are considered. Planning measures specifically related to air pollution and its control include: the siting of new towns only after a thorough study of local topography and meteorology; location of new industries using materials or processes likely to produce air contaminants in such a way as to minimize the effects of air pollution; restriction of the use of pollution-producing fuels in satellite (dormitory) towns; provision for green belts and open spaces to facilitate the dilution and dispersion of unavoidable pollution; greater utilization of hydro-electric and atomic power and of natural gas for industrial and domestic purposes; greater utilization of central plants for the provision of both heat and hot water for entire districts; and emphasis on traffic planning to reduce the level of pollution in residential areas.

SOCIAL ASPECTS

1973

37606 **APTIC NO. 59221**

Brunner, James A., Philip Gravengaard, and Gary Bennett

TOLEDO BUSINESS REPORT. POLLUTION IN THE LOCAL COMMUNITY: CITIZEN ATTITUDES AND WILLINGNESS TO MAKE PERSONAL SACRIFICES IN ABATEMENT. *Toledo Univ., Ohio, Business Research Center, Occasional Paper No. 23, 50p., Dec. 1973. 55 refs.*

A report based on a telephone-mail survey is presented on the attitudes of residents in the Toledo, Ohio area on pollution. A systematic probability sampling technique was employed to obtain a representative sample. Air and water pollution ranked second as the most serious problem in the area, exceeded only by that of drug usage. Sixty-one percent of the citizenry indicated that they would be willing to switch to nonleaded gasoline, but only 24% reported purchasing this type of fuel in the month prior to the survey. Forty percent indicated that they would be willing to use public transportation to and from work, but only 23% had ever used such transportation in the area. The majority of the respondents were willing to spend less than $200.00 for pollution control automotive devices, even though it is estimated that by 1976 the cost may be $873.00. Approximately 48% of those responding believed that zero population growth was the key to allevating the pollution problem. There was a willingness among 40% of the citizens to purchase a small automobile to alleviate the pollution problem, and 70% were willing to pay up to a 5% increase in their monthly electric bill for pollution reduction.

1970

37607 **APTIC NO. 59483**

Wood, F. G.

PRINCIPLES OF EVOLUTION AND THE ECOLOGICAL CRISIS. *Naval Undersea Center Symp. Environ. Preserv., Proc., San Diego, Calif., 1970, 16p. 18 refs. (May 20-21, Paper 215.)*

NTIS, DDC: AD 724709

Socio-economic and technical evolutionary concepts are examined in relationship to preserving the world s environment. A look at evolutionary concepts as they apply to all highly developed technological entities demonstrates that any abrupt change in form or function tends to be disruptive and disadvantageous, that lack of adaptability and increased vulnerability to change come with increased specialization, and that development often continues along particular lines to an extreme and disadvantageous degree. The automobile is cited as an example of a technical evolution that has become restricted to a narrower ecological niche and has resulted in adverse environmental effects such as carbon monoxide build-up which may alter the climate. Socio-economic factors rather than technological inadequacies are seeen as constituting the major hindrance to necessary change since human organizations, unlike human beings, are not highly adaptable. (Author abstract modified)

GENERAL

1973

37608 **APTIC NO. 59295**

Gilbert, T.

SECTION 1: GROUND LEVEL CONCENTRATIONS AROUND A PUNCTIFORM EMISSION SOURCE. SEMI-PRACTICAL STACK HEIGHT CALCULATIONS FOR A SINGLE SOURCE (VDI 2289 GUIDELINE, SHEET 1, SEPTEMBER 1973 DRAFT). *(Vortragsgruppe 1: Immissionskonzentration in der Umgebung einer Punktquelle Leitung: Praxismahe Schornsteinhoehenberechnumg fuer eine Einzelquelle (Richtlinie VDI 2289 - Blatt 1 (Entwurf September 1973))). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 200:7-12, 1973. 19 refs.*

New considerations which alter the former position on chimneys as set forth in the VDI guideline 2289, section 1 Dispersion of Pollutants in the Atmosphere, Relationships between Emission and Ambient Conditions, Chimney Heights in Flat, Unbuilt Areas are presented. The considerations include: calculation of effective source height according to Briggs; arrangement of the atmospheric conditions for dispersion in six classes; the use of statistical methods to describe regional differences in dispersion conditions within the B.R.D.; and a uniform level of air pollutants throughout the B.R.D. by means of equalized, newly planned emission sources. The newest recommendations of the VDI guideline 2289, section 1, Practical Applications of Dispersion Calculations are described.

37609 **APTIC NO. 59879**

Greenfield, Stanley M.

TECHNOLOGY AND GROWTH OR ENVIRONMENTAL QUALITY? *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Meteorological Society, Boston, Mass.; Dept of Transportation, Washington, D. C.; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronic Engineers, New York; Instrument Society of America, Pittsburgh, Pa.; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Rockville, Md., Joint Conf. Sensing Environ. Pollut., 2nd, Washington, D. C., 1973, p. 1-4. (Dec. 10-12, Paper ISA JSP 6651.)*

The cycle of technological advancement and degradation of the environment is generally discussed. The current energy crisis is man-made and can be alleviated if people reduce energy consumption; this would also improve the environment. But stopping the growth of society as a means of ensuring environmental quality is ridiculous. Unbalanced and excessive economic growth rates can cause environmental problems. These problems can be solved by research and development programs and environmental monitoring.

37610 **APTIC NO. 59740**

Henderson, John J., Ferris B. Benson, and D. E. Caldwell

INDOOR-OUTDOOR AIR POLLUTION RELATIONSHIPS: VOLUME II, AN ANNOTATED BIBLIOGRAPHY. *National Environmental Research Center, Research Triangle Park, N. C., Office of Research and Development, AP-112b, 45p., Aug. 1973. 107 refs.*

NTIS: PB 230899/AS

An annotated bibliography of 107 references on indoor-outdoor air pollution relations is presented. The annotations describe the scope of the studies and briefly summarize major results which are related to indoor-outdoor air pollution. A brief description of the experimental procedures employed is normally included. The publications are arranged alphabetically by author and are indexed by subject, geographical location, author, and title. The specific pollutants included are aldehydes, bacteria, carbon disulfide, carbon dioxide, carbon monoxide, gaseous acid, hydrocarbons, hydrogen chloride, hydrogen sulfide, lead, nitrogen oxides, oxidants, ozone, particulates, smoke, spores, and sulfur dioxide.

37611 **APTIC NO. 59378**

American Society of Civil Engineers, Environmental Engineering Research Committee

RESEARCH NEEDS IN ENVIRONMENTAL ENGINEERING IN WATER RESOURCES, WATER TREATMENT, ENVIRONMENTAL SANITATION, AND AIR POLLUTION. *Proc. Am. Soc. Civil Engrs., J. Environ. Eng. Div., 99(EE6):801- 812, Dec. 1973.*

Research needs in environmental engineering are reviewed for water resources, water treatment, environmental sanitation, and indoor and outdoor air pollution. Research is needed that will characterize air pollution found in homes, offices, public buildings, restaurants, and other living and working areas not within the purview of occupational safety and health. Measurements should be made of the parameters included in Environmental Protection Agency air quality standards (particulates, hydrocarbons, carbon monoxide, sulfur oxides, and nitrogen oxides) and of probable gases, fumes, allergens, and carcinogens that are derived from such activities and sources as do-it-yourself home repairs, hobby shops, heating and cooking, recirculating air conditioning, appliances, paints and varnishes, solvents, gasoline- powered tools and toys, pressure cans, pesticides, and smoking. Particular attention should be given to the effects of energy sources (e.g., electricity, gas, fuel-oil, and coal). General research needs in air pollution can be collated under five headings: air pollution impact of transportation systems, air pollution impact of construction practice, air pollution criteria for urban planning, civil engineering design for optimum energy use, and air pollution problems associated with sewage and industrial or solid waste disposal facilities.

37612 **APTIC NO. 59495**

CAUSES OF THE ENDANGERMENT OF HUMANS AND OF THE ENVIRONMENT. *(Die Ursachen der Gefaehrdung von Mensch und Umwelt) Text in German. Bull. Eidgenoess. Gesundheitsamtes Beilag B, no. 6:310-311, Dec. 1973.*

General causes and possible ways of abating environmental pollution are outlined. Increased in the population, industrial production, technological efficiency, the nearly unlimited use of irreplaceable natural resources, and the increased demand for high living standards have been the factors chiefly responsible for the deterioration of the environment. Population control and limitation of the production of goods and energy will be necessary if environmental pollution is to be abated. Production should be rationed rather than expanded to preserve natural resources and prevent increased environmental deterioration.

1971

37613 **APTIC NO. 59267**

Gilpin, Alan

AIR POLLUTION: CAUSES AND EFFECTS. *In: Air Pollution. St. Lucia, Australia, University of Queensland Press, 1971, Chapt. 2, p. 3-12. 5 refs.*

Sources of air pollution may be either natural or man-made. They may either be primary emissions from industrial, domestic, or automotive sources, or they may be formed in the atmosphere by interactions (photochemical or other wise) among primary contaminants or between contaminants and normal atmospheric constituents. The causes and effects of photochemical smog are presented, with the case of Los Angeles smog as an example. The ability of the atmosphere to naturally ventilate itself is explained, and, as is pointed out for Brisbane, Australia, natural geographic variations can cause the failure of these mechanisms to adequately disperse pollutants. A discussion of the long-term effects of air pollution on health points out the difficulty of establishing the precise role of pollutants in causing or contributing to ill-health. Bronchitis, lung cancer, and Tokyo-Yokohama asthma, and the effects of tetraethyl lead are considered. Other degradative effects of air pollution discussed are corrosion, effects on stonework, livestock, crops, and climate.

1970

37614 **APTIC NO. 59552**

Mammarella, Luigi

ENVIRONMENTAL POLLUTION, ITS URBANISTIC ASPECTS, AND MICROMETEOROLOGY OF URBAN AGGLOMERATIONS. *(L inquinamento ambientale e i suoi rapporti con l assetto urbanistico e la micrometeorologia degli agglomerati urbani). Text in Italian. Istituto de Fisica dell Atmosfera, Rome (Italy), 12p., IFA-RDP Rept. 34, Dec. 1970. (Presented at the Biennal Global Methodology Conference, 1st, Remini, Italy, Sept. 20-25, 1970.)*

NTIS: N72-28646

General urbanistic aspects of soil, water, and air pollution, a result of intensified urbanization and industrialization, are discussed. Air pollution, most hazardous of all forms of pollution due to steady contact with the need for air, is due mostly to domestic heating and automobile traffic in urban agglomerations. Sulfur dioxide, nitrogen oxides, carbon monoxide, and unburned hydrocarbons are the major pollutants in urban air. The effects of air pollution, and possible measures for its abatement in an urban environment should be taken into account in urban planning. Modern city planning should provide for improved ventilation possibilities and extended green spaces for the abatement of urban air pollution.

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